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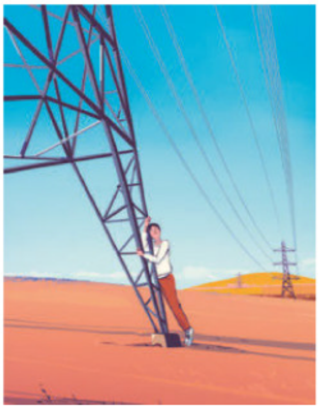

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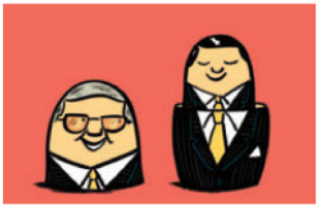

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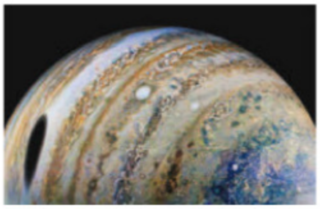

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The world this week Politics

Donald Trump appeared before a judge in Manhattan to plead not guilty to 34 charges of falsifying business records. They relate to payments he made before the 2016 election to a pornographic actress as hush money over an alleged fling. The charges were laid by a grand jury after the Manhattan district attorney revived the case. The violence from his supporters that some had feared ahead of Mr Trump's appearance did not materialise. Mr Trump is the first former American president to be charged with a crime. He described the case against him as a "witch hunt".

The left won two big elections in America. Brandon Johnson won **Chicago's** mayoral election; he was backed by teachers' unions and defeated a law-and-order candidate. And voters in **Wisconsin** chose a liberal judge for the state Supreme Court, ending its control by conservatives.

Rahul Gandhi, **India's** opposition leader, launched an appeal against his conviction for defaming Narendra Modi, the prime minister, during a speech in 2019. Mr Gandhi's conviction has resulted in him being disqualified from Parliament. His appeal starts on April 13th.

Australia's governing Labor Party won a seat from the opposition Liberals, the first time in over 100 years that an opposition party has lost to the government in a by-election. Aston, a suburb of Melbourne, had been a safe seat for the Liberals until last year's general election, when it became a marginal constituency. Anthony Albanese, the prime minister, is riding high in the polls, with an approval rating close to 60%.

Najib Razak, a former prime minister of **Malaysia**, lost his final appeal against a corruption verdict for which he has been sentenced to 12 years in prison. Meanwhile, the Malaysian Parliament voted to scrap mandatory **death sentences**, giving leeway to judges to impose other punishments, such as whipping. A moratorium on executions has been in place since 2018.

Israel's cabinet approved the creation of a national guard under the control of the national-security minister, Itamar Ben-Gvir. Mr Ben-Gvir is the leader of Jewish Power, a far-right party, and a ferociously anti-Arab politician. His opponents fear that he will use the force as his own publicly funded militia. Binyamin Netanyahu, the prime minister, authorised the force in order to prevent Mr Ben-Gvir from abandoning the governing coalition.

Egypt and **Syria** agreed to strengthen relations during the first official visit by a Syrian foreign minister to Cairo in more than a decade. It represents the latest effort by Arab states to mend ties with President Bashar al-Assad.

Burkina Faso, which experienced two military coups last year, lurched further away from France and America, which have been helping it fight a jihadist insurgency. It expelled two French journalists, one of whom had investigated a video in which Burkinabè soldiers appear to have filmed themselves murdering teenage boys. Burkina Faso also said it wants to buy weapons from North Korea.

Troops in an east African regional force recaptured the key **Congolese** border town of Bunagana, which had been under the control of the M23 rebel group. The regional force has been reinforced with a contingent from South Sudan and has received a pledge of soldiers from Angola, after rebels broke a ceasefire deal.

Guillermo Lasso, the conservative president of **Ecuador**, denied allegations that he had been involved in graft. Mr Lasso faces an impeachment trial in May. Congress is dominated by left-wingers who are hostile to Mr Lasso, a former banker.

Sound familiar?

Jair Bolsonaro, a former president of **Brazil**, returned to the country after three months in the United States. Thousands of his supporters stormed government buildings in January in an attempt to overturn his narrow election defeat in October. Mr Bolsonaro faces numerous legal probes in Brazil, including into whether he incited the rioters (he denies all allegations). If found guilty, he could be barred from public office for eight years.

The centre-right National Coalition Party took the most seats in **Finland's** general election and will try to form a coalition government under Petteri Orpo. It was a bitter defeat for Sanna Marin, the outgoing prime minister, whose Social Democrats came third by the number of seats. The right-wing Finns Party came second, and took 20.1% of the vote, its best share ever.

Ms Marin's biggest achievement in office was steering Finland through the crisis of Russia's invasion of Ukraine. Finland formally became a member of **NATO** this week, after Hungary and Turkey became the final two members of the military alliance to approve its application. Those two countries are still holding up Sweden's bid to join.

France's president, Emmanuel Macron, arrived in Beijing for a visit timed to coincide with one by the president of the European Commission, Ursula von der Leyen. They hoped to send a unified message to the Chinese leader, Xi Jinping, about how European leaders view ties with **China**. Mrs von der Leyen, however, has sounded more hawkish than Mr Macron, who flew to China accompanied by a large business delegation.

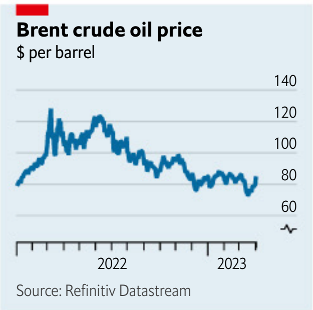
America's secretary of state, Antony Blinken, demanded that Russia release Evan Gershkovich, a **journalist** with the *Wall Street Journal*, who has been arrested and accused of spying for the United States.

An influential **Russian blogger** who supported Russia's war in Ukraine was assassinated by a bomb in St Petersburg. Russia blamed Ukraine for his death; Ukraine said he was a victim of Russian infighting. The authorities arrested a woman on suspicion of being involved.

The husband of Nicola Sturgeon, **Scotland's** former first minister, was arrested in connection with an investigation into party finances. Ms Sturgeon was the leader of the pro-independence Scottish National Party until she announced her resignation unexpectedly in February; her husband, Peter Murrell, served as the party's chief executive until last month.

A French revolution

In a triumph for pedestrians everywhere, Parisians voted in a referendum to ban rented **electric scooters** from their streets following a spate of injuries. Only 8% of those eligible to vote did so, but the result was 90% in favour of prohibiting the traffic-weaving, pavement-riding nuisances from the city.



Brent crude oil price

$ per barrel

Source: Refinitiv Datastream

Oil prices rose sharply after **OPEC+** announced a surprise cut to production. The cartel said it wanted to support stability in the market, which is another way of saying it didn't like the dip in oil prices in mid-March. It also wanted to deter speculators who have been betting on softer oil prices. OPEC+ is lowering output by a further 1.15m barrels per day, taking its reduction in supply to 3.66m bpd, or 3.7% of global demand.

Media reports suggested that **UBS** may cut up to 30% of the workforce, around 36,000 jobs, in the newly combined bank that emerges from its emergency takeover of **Credit Suisse**. Meanwhile the chairman of Credit Suisse, Axel Lehmann, apologised to investors at the 167-year-old bank's last-ever annual general meeting. In his opening speech, Mr Lehmann noted the "bitterness, anger and shock" of shareholders.

The chairman of **HSBC**, Mark Tucker, faced irate shareholders at a meeting in Hong Kong. Influential investors in the Chinese territory support proposals for HSBC to spin off its Asian business, which provides most of the bank's profits. The campaign is backed by Ping An, a Chinese insurance company and HSBC's biggest shareholder. Mr Tucker said the board's opposition to a split was unanimous. He also pledged to keep up dividend payments that had been cut during the pandemic.

China Renaissance Holdings, an investment bank based in Beijing, suspended trading in its shares and postponed its audited annual results, because the auditors cannot contact Bao Fan, the bank's chairman and founder, to sign off the report. Mr Bao disappeared in February. It is widely assumed that he has been detained by the authorities and is co-operating with an investigation.

The 11 countries in Asia and the Pacific that comprise the **Comprehensive and Progressive Agreement for Trans-Pacific Partnership** agreed to let Britain join the free-trade pact. The British government hailed this as a big post-Brexit win, but the gains to the British economy will be small, if not negligible.

The euro zone's annual rate of **inflation** slowed significantly in March, to 6.9% from 8.5% the previous month. However, core inflation, which strips out volatile food and energy prices and which economists worry about most at the moment, hit a new high of 5.7%.

Australia's central bank left its key interest rate unchanged at 3.6%, after a round of ten consecutive rises since May. Philip Lowe, the bank's governor, recognised that "monetary policy operates with a lag" and the rate increases had yet to be felt. But he also said that some further tightening may be needed to bring down inflation.

An obit for Virgin Orbit

Virgin Orbit filed for bankruptcy protection in America. The satellite-launch firm, backed by Sir Richard Branson, went public on the Nasdaq stock exchange in 2021 by merging with a special-purpose acquisition company (SPAC). But its business of offering cheap, small-scale launch services to the rapidly growing space industry couldn't capture a significant slice of an increasingly competitive market.

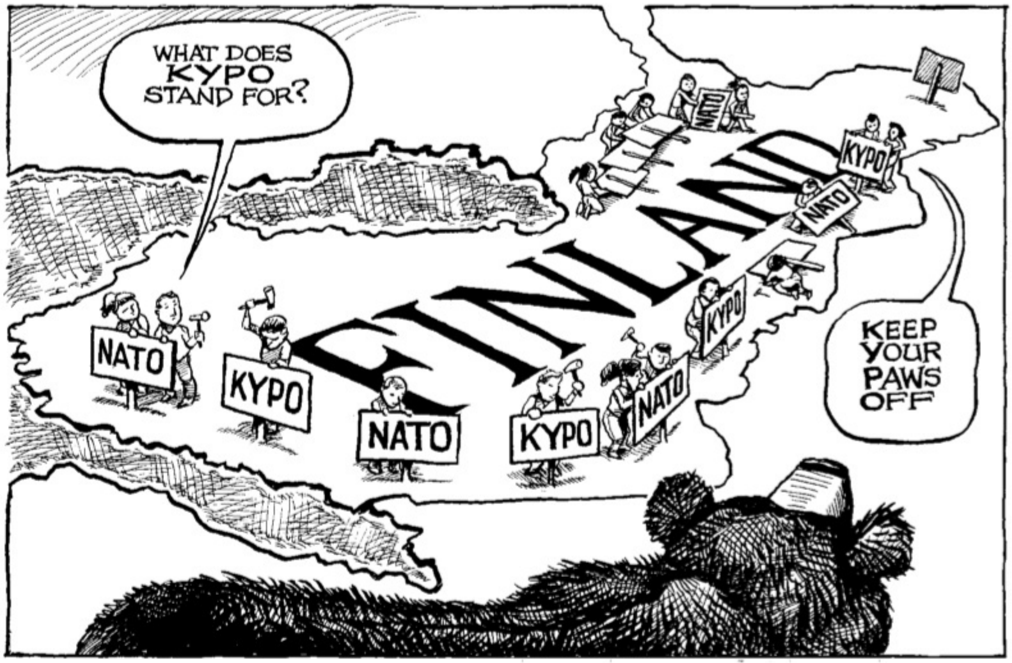
Tesla delivered almost 423,000 cars in the first quarter, up by around a third from the same period last year. Its share price fell on the news since markets were expecting even higher sales given Tesla's recent price cuts for customers.

Teck Resources, a Canadian mining company, rejected an unsolicited takeover bid from **Glencore**, which wants to spin off their combined coal businesses. Mining coal is still profitable, despite the turn to renewable energy. Teck also owns several copper mines, an attractive asset at a time when miners can't get enough of the metal, which is prized because of its extensive use in building new energy infrastructure for electric cars, solar, wind and the like.

Italy's data-protection regulator temporarily banned ChatGPT because of concerns over privacy violations. Italy is the first country in the West to prohibit the **generative artificial-intelligence** chatbot. Germany's data-privacy boss suggested that his country could do the same. Not everyone agrees. Matteo Salvini, Italy's deputy prime minister, said the decision was "hypocritical" given that virtually everything online raises questions of privacy.

Get ready to rumble

The companies behind the **Ultimate Fighting Championship** and **World Wrestling Entertainment** agreed to merge in a $21.4bn deal. Both organisations are social-media powerhouses, with UFC punching above 15m subscribers on YouTube and WWE pinning down 94m. Conor McGregor, arguably the biggest star in mixed martial arts, suggested that he wants to become the first combined UFC and WWE world champion.



Hug pylons, not trees

The case for an environmentalism that builds

THE SHEER majesty of a five-megawatt wind turbine, its central support the height of a skyscraper, its airliner-wingspan rotors tilling the sky, is hard to deny. The solid-state remorselessness with which a field of solar panels sucks up sunshine offers less obvious inspiration, but can still stir awe in the aficionado. With the addition of some sheep safely grazing such a sight might even pass for pastoral. The sagging wires held aloft by charmless, skeletal pylons along which the electricity from such installations gets to the people who use it, by contrast, are for the most part truly unlovely. But loved they must be.

If the world's climate is to be stabilised, stopping electricity generation from producing fossil-fuel-derived emissions is crucial. So is greatly increasing the amount of electricity available. With more generating capacity, it will be possible to power motor vehicles and warm homes with electricity, rather than by burning dirty fuels. Expanding access to power for people in the poorest countries will reduce emissions from biomass burning and greatly improve living standards. More copious and reliable electricity will be needed for effective adaptation, too. If heatwaves are not to become ever more lethal (see Asia section), grids in developing countries will have to reliably power wider use of air conditioning in energy-hungry cities.

The trouble is that the scale of the changes needed to adapt the world's electricity grids is vastly underappreciated. Too little investment is taking place. Planning rules get in the way. And, in a deep and damaging irony, some of the biggest advocates of slowing climate change do not accept the logic that to do so requires building more.

As our Technology Quarterly explains, expanding and greening the grid will be demanding—and phenomenally expensive. A recent report by the Energy Transitions Commission, a global group of experts, sees the split in costs between the new generating capacity needed for an ample supply of clean electricity and the distribution, transmission and storage systems needed to make that supply useful as a roughly 55:45 proposition. The 45% that goes on grids and storage comes to about $1.1trn a year between now and the middle of the century. For comparison, the International Energy Agency, an intergovernmental think-tank, reckons that worldwide spending on electric grids is currently around $260bn a year: far less than is needed and, tellingly, less than is invested in upstream oil and gas.

In addition to investment in new projects, existing ones must be speeded up. Too many that need connections are delayed by red tape, as are vital new transmission lines. Reforms to planning rules must make it easier to build big and often unpopular bits of infrastructure (see United States section).

If those plans are to work, and to do so legitimately, there also needs to be less objection to building in the first place. That would make timid politicians more comfortable with legislation designed to streamline things; it would hasten the arrival of essential new capacity; and, by reducing uncertainty, it would lower the cost of capital.

One way forward is incentives. Modern grids allow for more local energy markets; they make it more feasible, say, to lower the cost of electricity to people who have a wind farm nearby, or whose land is needed for transmission lines. A scheme whereby some postcodes in England have lower electricity prices when the winds spinning a nearby turbine get stronger seems to have proved popular. Variable prices can both favour people near renewables and improve overall grid efficiency.

The design of such incentives will be important. Research undertaken in Germany shows that when landowners get money but the community at large does not, opposition can increase. Even when everyone gets a share, enthusiasm may not follow; being offered money makes people worry about what, exactly, they are giving up. Other European studies show that clear communication about the decarbonisation a project is designed to bring about works in a way cash does not.

We had to loot the planet in order to save it

That leads to the crux of the matter. The strongest objections to building are often lodged in the name of the environment, and by those keenest on a greener future. The skyline must be preserved, they might say, or the woodland is too ancient to fell, or the colony of terns too important in and of itself.

But climate change is a problem of a different magnitude from almost all other environmental concerns, and of a different kind. That it was brought to the world's attention mostly by the environmentally minded is to the movement's credit. But it cannot be tackled merely with the values central to classical environmentalism. Those most anxious to achieve the energy transition must acknowledge that more building is the most practical course of action.

And it is economic growth that will make possible the building of new transmission lines, gigawatt-scale renewable power installations and, indeed, the mines from which the minerals these things need are sourced. To demonise it, as some environmentalists do, is to expose the world to more climate change, not less. Many environmentally minded politicians now boast of the "green jobs" that their policies will bring. Seeking extra jobs makes sense only in the context of the continued economic growth they make possible.

Those who believe there is no way to stop climate change through growth are fond of quoting Albert Einstein to the effect that "We cannot solve our problems with the same thinking we used when we created them." This has two difficulties. One is that there is no evidence that Einstein actually said it. The second is that to change the way the world thinks, person by person, is a yet more ambitious task than changing the ways in which the world generates and distributes its electric power.

If the energy transition cannot be achieved with the habits of mind already available, it is hard to see that it can be achieved at all. For some of those who see themselves as green, that may be a counsel of despair. To those who want humans to flourish on a planet they can care for, the idea of an environmentalism that builds must be a call to action. ■

Trans treatments

The dangers of gender medicine

Too many doctors have suspended their professional judgment

For many Americans, the great tragedy of trans rights is the story of how Republican governors and state legislatures are stigmatising some of society's most put-upon people—all too often in a cynical search for votes. This newspaper shares their dismay at these vicious tactics. In a free society it is not the government's place to tell adults how to live and dress, which pronouns to use, or what to do with their bodies.

However, nestled within that first tragedy appears to be a second—this time a tragedy of good intentions. On different sides of the Atlantic, medical experts have weighed the evidence for the treatment of gender-dysphoric children and teenagers, those who feel intense discomfort with their biological sex. This treatment is life-changing and can lead to infertility. Broadly speaking, the consensus in America is that medical intervention and gender affirmation are beneficial and should be more accessible. Across Europe several countries now believe that the evidence is lacking and such interventions should be used sparingly and need further study. The Europeans are right.

The number of children and teenagers diagnosed with gender dysphoria in America has soared. One estimate found that there were over 42,000 new diagnoses in 2021, three times the count in 2017. Gender-affirming care, as America understands it, stipulates counselling, which can lead to puberty-blocking drugs and subsequently cross-sex hormones (testosterone for girls and oestrogen for boys—used, by one estimate, in 10% of cases). Occasionally, there may be mastectomies and, very rarely in the under 18s, the construction of ersatz genitals from flaps of skin or pieces of bowel. The goal is to align the patient's body with the way that they think about themselves.

Proponents say that the care is vital to the well-being of dysphoric children. Failure to provide it, they say, is transphobic, and risks patients killing themselves. The affirmative approach is supported by the American Academy of Paediatrics, and by most of the country's main medical bodies.

Arrayed against those supporters are the medical systems of Britain, Finland, France, Norway and Sweden, all of which have raised the alarm, describing treatments as "experimental" and urging doctors to proceed with "great medical caution". There is growing concern that, if teenagers are offered this care too widely, the harms will outweigh the benefits.

As we report in this week's briefing, one concern is that doctors have changed the safeguards built into the original treatment design, devised in the Netherlands in the 1980s and 1990s. Twenty years ago, the typical patient was male, with a long history of dysphoria. Children and teenagers with psychological problems besides dysphoria were disqualified from treatment. These days most patients are adolescent girls. Their dysphoria may be relatively recent. Some are depressed, anxious or autistic, but mental illness is no longer a hard barrier to treatment. Do these patients respond to drugs and surgery in the same way?

It is unclear. And that is because the clinical evidence for intervention in broader categories of adolescents is vague. A formal British review of the clinical evidence, prepared in 2020, found that almost all the studies in this area were of poor quality; one in Sweden came to similar conclusions. When researchers find benefits, the effects tend to be small. It is often impossible to conclude whether they are lasting, or how much the credit is down to drugs or counselling or both. Some older studies suggest that, left alone, most children will naturally grow out of their dysphoric feelings. The long-term effects of puberty-blockers remain unknown, though there are worries about brain development and decreasing bone density.

Medical bodies build safeguards into their treatment protocols, but they vary. And in any case practitioners may ignore them. Whistle-blowers say that some children and teenagers are being put on puberty-blockers after only a cursory assessment. A growing number of "detransitioners", who regret their treatment, say that they have been left scarred, infertile, with irreversibly altered appearances and were unhappy with how their dysphoria was treated.

America's professional bodies acknowledge the science is low quality, but say they have a duty to alleviate patients' mental anguish. Some patients suffer regret in all medical procedures, from knee surgery to liposuction. And they observe that the most shocking allegations about poor treatment are only anecdotes. Speaking on American radio last year, Rachel Levine, assistant secretary for health and a paediatrician, was very clear: "There is no argument among medical professionals...about the value and the importance of gender-affirming care."

Except that there is. And when medical staff raise concerns—that teenage girls may be caught up in a social contagion, say, or that some parents see transition as a way to have a straight daughter rather than a gay son—they have been vilified as transphobic and, in some cases, suffered personal and professional opprobrium.

Medical science is not supposed to work this way. Treatments are supposed to be backed by a growing body of well-researched evidence that weighs the risks and benefits of intervention. The responsibility is all the heavier when treatments are irreversible and the decisions about whether to go ahead are being taken by vulnerable adolescents and their anxious parents.

What to do? To some, the uncertainties that surround medical interventions are grounds for an outright ban. In fact, the lack of evidence cuts both ways. Perhaps, when proper trials are complete, their proponents will be proved correct. The right policy is therefore the one Britain's NHS and the Karolinska Institute in Sweden seem to be working towards. This would promote psychotherapy and reserve puberty-blockers and cross-sex hormones for a system in which patients would almost always be enrolled in a well-run clinical trial.

Ideally, American regulators would insist on trials, too. If the culture wars put that compromise out of reach, professional bodies should uphold their own protocols by welcoming whistle-blowers and advance science by calling on patients to be in trials. Sometimes, they will need to protest against illiberal laws. Above all, they should not add to the tragedy. ■

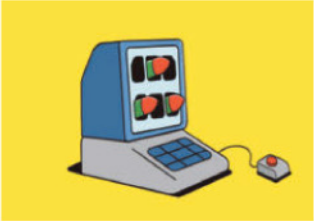
Cyber-attacks

Use the force—responsibly

State hackers need to wield their weapons with precision and care

RUSSIA’S CYBERWAR in Ukraine has been as reckless as its physical one. Its cyber-attack on satellites on the first day of fighting mistakenly spilled over into almost 6,000 German wind farms. It sprayed “wiper” malware across the country, irreversibly destroying data. And it directed attacks at civilian power and water infrastructure, adding to the misery of its shells and rockets. It has been one of the most intensive cyber-campaigns ever conducted—and perhaps the most irresponsible.

But what is a responsible cyber power? On April 4th Britain’s National Cyber Force (NCF) sought to answer that question by publishing a document setting out how it views the purpose and principles of “offensive cyber”—the disruption of computer networks, as distinct from cyber-espionage. It also revealed the identity of the NCF’s commander, James Babbage, who has given his first interview, to *The Economist* (see Britain section).



Britain’s transparency is a welcome step forward. Cyber operations are shrouded in secrecy. They can spill over into the computer networks that modern economies and societies depend on—a Russian cyber-attack in 2017 caused more than $10bn of damage. Their potential is also poorly understood. Many political leaders mistakenly view them as strategic weapons to deter enemies.

The NCF’s new paper is important because it spells out a realistic and circumscribed view of cyber power. It says that its main purpose is not so much kinetic—a digital substitute for air strikes—as cognitive. Russia’s cyber-enabled disinformation is often aimed at entire populations. Britain says its targets are typically individuals and small groups. A cyber-attack might, for example, tinker with their communications so they are paralysed by confusion, or turn on one another.

The British example suggests several criteria to judge whether cyber power is being used responsibly. The first is what sort of targets are chosen. North Korean hackers once attacked an American film studio because it released an unflattering movie about Kim Jong Un, the country’s leader. Iran has attacked American banks in response to sanctions. Russia has used cyber tactics to meddle in elections in America and Europe.

Another is how well attacks are calibrated. Are they precise in their effects and mindful of escalation? Or do they hurl malicious code around wildly? Officials and experts have spent years debating how international law, including the laws of armed conflict, apply to cyberspace. The Tallinn Manual, associated with NATO, is one such guide. Russian intelligence services do not pay much attention to this sort of thing, but responsible cyber commanders need lawyers by their side.

A third test is how well cyber forces protect their arsenals. The hacking tools used by states are often powerful and dangerous. They can cause considerable harm if they become widely available. In 2017 a North Korean cyber-attack spread ransomware worldwide in part by repurposing malicious code that had leaked out of America’s National Security Agency (NSA). As more countries embrace offensive cyber operation, the security of their tools will become a bigger issue.

Finally, cyber forces need accountability. Britain’s view of offensive cyber as a means of targeted psychological disruption, rather than an all-purpose weapon of power projection, has much to commend it. But it also pushes cyber power into the murky realm of covert action. Oversight of this is doubly hard: the work is both highly secret and also highly technical. Lawmakers and judges often struggle to grasp the details.

For the time being, Britain’s approach is to be welcomed. Ten years ago Edward Snowden, a former NSA contractor, sent shock waves through the NSA and GCHQ, its British counterpart, by publicly revealing their industrial-scale intelligence collection in cyberspace. A decade on, the spooks seem to have learned that responsibility requires scrutiny. ■

An American first

The Trump Show

What America’s friends should make of the latest drama

YOU HAVE to hand it to The Trump Show. Just when you thought it had little left to offer, back it comes with a blockbuster episode. This week it offered a sensational courtroom drama, as Donald Trump became the first former American president to face criminal charges—34 of them in all. Those charges, which stem from three sets of hush money, including one to a former porn star, allegedly involved falsifying business records and the violation of campaign-finance laws. They are familiar, but lurid enough to grip an audience. Mr Trump has denied them all. America is, as ever, bitterly divided in its reactions, but united in being glued to the spectacle. What should the rest of the world make of it? Two contrasting reactions are in order.

One is to be relatively relaxed. All this may be a first for America, but not for other democracies, where taking former leaders to court is pretty common. From France (think of Jacques Chirac and Nicolas Sarkozy) to Italy (Bettino Craxi, Silvio Berlusconi) and Israel (Moshe Katsav, Ehud Olmert and now Binyamin Netanyahu), the list of prosecuted former presidents and prime ministers is long. In Taiwan indicting ex-presidents verges on a tradition. Brazil’s president, Luiz Inácio Lula da Silva, is back in office after a 580-day stint in prison. This week a former president of Kosovo, Hashim Thaci, pleaded not-guilty to war crimes ▶▶

and crimes against humanity at a special tribunal in The Hague. Though Mr Trump calls his legal reckoning “AN ATTACK ON OUR COUNTRY THE LIKES OF WHICH HAS NEVER BEEN SEEN BEFORE”, elsewhere such things have not obviously been a disaster for democracy. Often, it is quite the reverse.

True, Mr Trump’s opponents have tried and failed to take him down by means of the political system. The House of Representatives impeached him twice; twice the Senate could not muster the two-thirds vote needed to convict him. America’s constitution deliberately makes the impeachment process hard. Mr Trump survived the made-for-TV hearings of the House’s January 6th committee. Now the effort to punish him through the courts is starting with what appears to be the flimsiest and most convoluted of the various legal cases threatening him. For that reason, the indictment in New York looks like a mistake. But prosecuting a former president at least affirms a core principle of democracy, that no one is above the law.

Serious soap

On another level, however, America’s friends should be alarmed. Many have spent the past two years in blessed relief that Mr Trump is no longer in power, desperate to believe that, surely, given his misconduct after the election in 2020 and his many troubles (from legal jeopardy to electoral setbacks and the rise of rivals), he cannot return to the White House. Such insouciance, always naive, now seems reckless, too. The latest attack has strengthened Mr Trump’s status as the Republican front-runner, with a hard but plausible path back to the presidency (see Lexington). That will start to influence countries’ calculations.

Take Ukraine. Its leaders will conclude that the possibility of Mr Trump’s return to power makes it all the more vital to achieve military gains sooner rather than later. In Moscow Vladimir Putin will draw the opposite conclusion, that he should hold out for a time when Ukraine’s main Western backer might have a commander-in-chief who scorns the country and says Russia will eventually conquer all of it. Or take NATO. Many have feared a second-term Trump would abandon it. Fortunately, Russia’s aggression has strengthened the alliance and expanded it. On the day Mr Trump appeared in court, Finland formally became NATO’s 31st member. All of them now have a greater interest in fortifying the alliance to withstand another Trump shock.

Of course, a lot could happen to prevent a new White House series of The Trump Show. Now that the Manhattan case has created an American precedent for indicting a former president, it becomes more likely that other, stronger cases will follow—on election interference in Georgia, for example, or on his mishandling of classified documents. Legal imbroglios could yet overwhelm Mr Trump. Even if he wins his party’s nomination, thanks to his strength with the Republican base, the broader electorate may punish him in a rematch with Joe Biden. More twists in the soap opera are guaranteed. But America’s friends should remember the awful truth: it is reality, not a show. ■

Global finance

How to fix the IMF

The fund must get tough on obstructive creditors like China—but save them a seat at the table

EVER SINCE it was founded in 1944, the IMF has had to get used to reinventing itself. Today, however, it faces an identity crisis like none before. The fund, whose annual spring jamboree kicks off on April 10th, is supposed to provide a financial safety-net for countries in distress. Yet, although the poor world is in the throes of the worst debt crisis in decades, the fund seems all but unable to lend (see Finance & economics section). An extra $1trn has been committed to the IMF since the covid-19 pandemic began; however its loan book has grown by a paltry $51bn.

The fund is paralysed because it is a multilateral institution that aspires to represent the whole world, at the same time as being a club which is controlled by America and its Western allies. That worked when America was the world’s dominant power and was intent on pursuing liberal internationalism. Now China is trying to build an alternative order and America is turning inward. Unless the fund acts soon, its ability to do its job as a crisis lender will be in question.

In its infancy the IMF’s main role was to promote balanced trade and manage the Bretton Woods system of fixed exchange rates. It was only when those arrangements collapsed that it shifted its focus to another of its missions: providing emergency cash, with strings attached, to countries in crisis. From the 1980s, and especially during the Asian financial crisis in 1997, the fund became known for its unyielding application of economic orthodoxy. In the 2010s it revised some of its views on austerity and capital controls, and tried to promote its softer side.

Today the fund’s role as a crisis lender is both shrunken and less successful. Many big emerging markets have amassed vast quantities of foreign-exchange reserves to guard against currency crises. Some 30% of the fund’s outstanding lending has gone to just one borrower, Argentina. The IMF lends to countries like Egypt and Pakistan, which are strategically important to America. But these have gained licence to put off reform indefinitely; the fund has been urging Pakistan to mend its sales tax since at least 1997. And the IMF is no longer the only crisis lender in town. Gulf countries including Saudi Arabia now offer emergency cash, often using obscure methods, say by depositing money at the borrower’s central bank.

The main problem is that China has become a big creditor to the poorest countries, whose needs are small but urgent. Rising interest rates and the pandemic have left at least 21 in default or seeking debt restructuring, and many more look fragile. Yet China is reluctant to participate in debt write-downs, in part because it objects to the IMF not bearing its share of losses—a vital safeguard for a lender of last resort. The fund has not overseen a single write-down involving China since the crisis started.

Without them, countries’ finances may not be sustainable even as creditors are bailed out. America worries about IMF funds flowing into China’s pockets. Although many loans have been approved, most are supposed to be conditional on restructuring that has not been agreed on—much of the cash intended for Suriname, for example, has been in limbo for more than a year. As the fund has floundered, China has boosted its own emergency lending.

Together these trends risk making the IMF irrelevant—just like another global institution, the World Trade Organisation, which has also been sabotaged, this time by America. With debt talks frozen, the fund is conjuring up new goals, such as lending to help with climate change. That has caused a turf war with the World Bank, which is better suited to project finance.

The fund does not need a new mission. It needs the ability to get tough on rogue creditors. For some the solution is for it to align itself explicitly with the West, perhaps by implementing restructurings that ban countries from ever again borrowing from unco-operative official creditors. But even if such a policy were credible, it would be a mistake to freeze out China entirely. Not only would it be against the spirit of the fund's mission, but if countries are forced to make a once-and-for-all choice between financial spheres, some may well choose China's.

Instead the IMF should make borrowers suspend payments on their debts to obstructive official creditors for as long as a fund programme is active. That would circumvent and punish lenders that block restructuring, while leaving open a path to their participation should they decide to behave constructively. The IMF would remain open and global. It would not push China away, but save a seat at the table should it choose to take one. Such a strategy would echo the fund's inclusive approach to several communist states in the cold war.

Though the IMF should not close itself off, the sooner it can bypass today's blockages, the better. Helping countries in crisis is much harder and less glamorous than it used to be. But it is still essential. ■

Universities

Higher expectations

Students are veering away from dodgy degrees. Governments should help them

IT IS FASHIONABLE to be gloomy about the costs and benefits of a degree. In America a majority of people now tell pollsters that they think going to university is not worth it. For the average undergraduate that is far from the truth. In rich countries people who hold a bachelor's degree earn over 40% more than those who do not. This premium has remained lofty, even as the number of university-goers has soared: some 33m people are studying undergraduate degrees across the rich world today.

Yet those average figures hide queasily large differences (see International section). For a shocking share of students, the returns from attending university are puny. About 25% of men and 15% of women graduates in England would have been better off financially had they not bothered. In total, student debt has reached $1.6trn in America, 60% more than is owed on credit cards. Low earnings help explain why about a fifth of America's student borrowers were in default before the pandemic.

Those who do worst out of higher education attend shoddy institutions, are badly prepared, give up, or choose subjects that lead to low wages. Many who do complete their courses are loaded with debt and equipped with a degree of peripheral relevance that has been taught badly. They are being ripped off, not prepared for a better life.

The good news is that young people are voting with their feet. A dramatic shift is taking place as students switch to subjects that are linked to better earnings. In America, for example, the numbers enrolled in computer science have more than doubled in a decade. Those studying English and history, subjects that are less likely to raise wages, have fallen by about a quarter. Some universities have begun to cull courses.

Governments should seek to accelerate this adjustment in the higher-education marketplace. But all too often their instinct is to throw money at the problem. President Joe Biden wants America's Supreme Court to approve his plan to forgive a large chunk of the country's student debts, as a one-off. He also hopes to tweak the rules on repayment, which will make the federal loan system a bit more generous. Together these changes could cost hundreds of billions of dollars over the next decade. The danger is that they will make America's students less discerning about how much they borrow and what they use the money for. Without a disciplining mechanism, pricey universities will be even more inclined to raise their fees.

A better alternative would be for governments to invest in giving students the information they need to make sensible choices. Britain has pulled together detailed data about how much graduates from thousands of courses at hundreds of institutions go on to earn, but it does a poor job of supplying this to all applicants. America has been working on something similar, but laws that limit federal data-crunching are getting in the way. Some youngsters, often the better-off ones, are already making good use of data. Supplying it to everyone else should be a priority. Modest spending on career counselling in secondary schools could help reduce the billions spent on writing off student loans down the line.

Governments should also be fussier about which courses their cash helps pay for. Programmes at all levels that wish to benefit from state funds should have to clear a basic quality hurdle—for example, that a majority of the students who enroll in them eventually end up earning more than high-school graduates. Mr Biden would like a limited rule of this kind to come to America. But a decade has passed since such talk began.

Some universities and colleges resist these kinds of safeguards. They argue that trying to weed out poor-value courses and to focus government lending will compromise the pursuit of knowledge and penalise poor families and minorities by limiting what they can study. However, the real problem is that the status quo is leading too many people to pursue shoddy but expensive degrees. The goal should be an education system that steadily adapts to the shifting preferences of society and the demands of the labour market—and one that has a low tolerance for degree courses that fail young people. ■

Letters

Factors in life expectancy

You reported on the decline in life expectancy in Britain ("The missing quarter of a million", March 11th). However, this is not a story of a failed health system. Rather it is a story of success driven by drug development and health care over the past 40 years. Premature mortality decreased from the 1990s to the 2010s, primarily because of improvements in cardiovascular treatment. This decrease plateaued in the 2010s, not because of a failure in medicine and social structures, but because, given patient adherence levels, maximum efficiency was reached.

The reduction in child mortality over the four decades to the 2010s can be explained mostly by improved road safety, suffocation risk-reduction measures (inhalation holes in plastic bags, pen lids and toys), and leaps forward in the treatment of haematological cancers and childhood neoplasms more broadly. Medical science continues to reduce childhood mortality and will cut deaths from disease in children to below the figure of seven per 100,000 in Britain in 2020.

Modern medicine is not a panacea. With over three times as many people in deprived areas still smoking compared with higher income areas, and most Britons becoming overweight or obese in their 20s onwards, we know there are health consequences to our life-style choices as adults.

DR GRACE LOMAX
Clinical director
Clarivate
London

Improving the lifespan means that ageing becomes an opportunity, not a cost. People work longer, spend more, volunteer and provide care. In countries such as Canada, where 6% of health spending goes on prevention, there are lasting and significant impacts. Across the G20, increasing preventative health spending by just 0.1% could unlock a 9% increase in annual spending by people aged 60 and over. We are at risk of heading in the wrong direction. In Britain spending to help people stop smoking has been reduced, yet fewer smoking-related diseases would boost the British economy by as much as £19bn ($23bn) a year. There is a clear economic argument as well as a moral one for committing to longer lives for all.

DAVID SINCLAIR
Chief executive
International Longevity Centre
London

Future of the Chagos Islands

Simon Jackson wonders why Mauritius is keen to obtain the Chagos Islands (Letters, March 18th). These islands have always been part of Mauritius. In the Lancaster House Agreement of 1965 Britain promised to return them to Mauritius when they were no longer needed for defence purposes. Neither the Seychelles nor the Maldives have any historical links to, or have ever made a claim to, Chagos, even if the archipelago is closer to their shores. But then the Channel Islands are much closer to France than Britain.

Mauritius is committed to the American base remaining on Diego Garcia and has offered a 99-year lease and also to facilitate and finance the resettlement of Chagossians who wish to return. Mauritius also supports the continuation of a marine protected area.

An overall settlement is the purpose of the current negotiations between Britain and Mauritius, which America and the Chagos Islands All-party Parliamentary Group fully support. Both governments expect to conclude an agreement within the coming months. Britain can no longer ignore resolutions at the UN General Assembly and the rulings of international courts, nor the opprobrium that its unlawful occupation of the Chagos conveys.

DAVID SNOXELL
Co-ordinator of the Chagos Islands All-party Parliamentary Group
High Wycombe, Buckinghamshire

The Fed's policy choices

Your article suggesting that the Federal Reserve must choose between inflation and financial stability ("Stick or twist", March 19th, digital editions) underestimates the importance of the central bank's new liquidity facility, the Bank Term Funding Programme. As you point out, many banks hold mark-to-market losses as a result of rising interest rates. The new facility puts a floor on those losses for up to a year by lending at par values, in effect providing amnesty to banks with sufficient Treasury holdings. And you are right that the broader economy can shoulder higher rates, and few banks are as brazen in risk control as those that have floundered.

The Fed doesn't need to prevent all losses for banks indefinitely—it just needs to provide time and a safety net for those banks to adjust to a changing environment. The new liquidity facility does just that. With its short-term rate-insurance policy, the Fed indeed can walk and chew gum at the same time.

VINCIENT ARNOLD
Research associate
Yale School of Management
New Haven, Connecticut

Crooked car washes

Our organisation, set up by the Church of England to fight modern slavery, is all too familiar with the exploitative hand-car-wash businesses that Bagehot described (March 18th). The police do intervene when extreme cases are discovered, but as exploitation occurs on a sliding scale it often goes undetected. There are thousands of businesses that do not treat their workers properly. Many workers don't have the appropriate protective gear, or are under age or live on site in poor conditions. Sometimes they are paid next to nothing and face a variety of other unsafe, unfair and controlling practices.

To try to identify exploitative businesses in the hand-car-wash sector, we have developed the Safe Car Wash App. We would urge readers to download the app and use it whenever they visit a hand car-wash. By doing this they can help law-enforcement agencies free victims of modern slavery and exploitation. We would also encourage policymakers, as Bagehot suggests, to start taking seriously the need to crack down on law-breaking businesses before more lives are ruined.

CAROLINE VIRGO
Director
Clewer Initiative
London

Thrown out of the club

Brian Olney pointed out your excessive use of "a club of mostly rich countries" to describe the OECD (Letters, March 25th). He was being too kind. The phrase is inaccurate and insipid. "Mostly rich" does not describe Luxembourg; "blessedly rich" would be more like it. Should the countries that do not fall under the definition of "mostly rich" be asked to leave? And why use the somewhat disparaging "club"? Do OECD members sit around in upholstered chairs in some stuffy Victorian building in the West End of London?

JOHN ASTELL
Holden, Massachusetts

We fry our best

As I read your article on America's egg business my hopes gradually rose that you would avoid the yoke/joke pun ("Eggstortionate", March 18th). Alas, "it is no yolk!" concluded the final sentence. I was beaten, my mood cracked, my equanimity scrambled. But I appreciate your hard-boiled journalism too much and I will continue to shell out for my weekly copy.

RICHARD HOOPER
Nairobi

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Trans substantiation

The evidence to support gender transitions in adolescents is worrying weak

PRISHA MOSLEY was 17 when she was first given testosterone in a clinic in North Carolina, after she had declared to her parents that she was a boy. She had struggled through her teen years with anorexia and depression after a sexual assault. Luka Hein had both breasts removed as a 16-year-old in Nebraska. Chloe Cole, in California, was a year younger when she had her double mastectomy. She had been on testosterone and puberty-blocking drugs since 13, also after a sexual assault.

All three girls were experiencing "gender dysphoria", a feeling of intense discomfort with their own sexed bodies. Once a rare diagnosis, it has exploded over the past decade. In England and Wales the number of teenagers seeking treatment at the Gender Identity Development Service (GIDS), the main clinic treating dysphoria, has risen 17-fold since 2011-12 (see chart 1 on next page). An analysis by Reuters, a news agency, based on data from Komodo, a health-technology firm, estimated that more than 42,000 American children and teenagers were diagnosed in 2021—three times the count in 2017. Other rich countries, from Australia to Sweden, have also experienced rapid increases.

As the caseload has grown, so has a method of treatment, pioneered in the Netherlands, now known as "gender-affirming care". It involves acknowledging patients' feelings about a mismatch between their body and their sense of self and, after a psychological assessment, offering some of them a combination of puberty-blocking drugs, opposite-sex hormones and sometimes surgery to try to ease their discomfort. Komodo's data suggest around 5,000 teenagers were prescribed puberty-blockers or cross-sex hormones in America in 2021, double the number in 2017.

Dysphoria furoria

The treatment is controversial. In many countries, but in America most of all, it has become yet another front in the culture wars. Many on the left caricature critics of gender-affirming care as callously disregarding extreme distress and even suicides among adolescents with gender dysphoria in their determination to "erase" trans people. Zealots on the right, meanwhile, accuse doctors of being so hell-bent on promoting gender transitions that they "groom" vulnerable teenagers—a term usually applied to paedophiles. In October supporters and critics of gender-affirming care held rival, rowdy protests outside a meeting of the American Academy of Paediatrics. Several American states, such as Florida and Utah, have passed laws banning gender-affirming care in children. Joe Biden, America's president, has described such laws as "close to sinful".

Almost all America's medical authorities support gender-affirming care. But those in Britain, Finland, France, Norway and Sweden, while supporting talking therapy as a first step, have misgivings about the pharmacological and surgical elements of the treatment. A Finnish review, published in 2020, concluded that gender reassignment in children is "experimental" and that treatment should seldom proceed beyond talking therapy. Swedish authorities found that the risks of physical interventions "currently outweigh the possible benefits" and should only be offered in "exceptional cases". In Britain a review led by Hilary Cass, a paediatrician, found that gender-affirming care had developed without "some of the normal quality controls that are typically applied when new or innovative treatments are introduced". In 2022 France's National Academy of Medicine advised doctors to proceed with drugs and surgery only with "great medical caution" and "the greatest reserve".

▸▸

There is no question that many children and parents are desperate to get help with gender dysphoria. Some consider the physical elements of gender-affirming care to have been life-saving treatments. But the fact that some patients are harmed is not in doubt either. Ms Mosley, Ms Hein and Ms Cole are all “detransitioners”: they have changed their minds and no longer wish to be seen as male. All three bitterly regret the irreversible effects of their treatment and are angry at doctors who, they say, rushed them into it. Ms Cole considers herself to have been “butchered by institutions we all thought we could trust”.

The transitioning of teenagers has its roots in a treatment protocol developed in the Netherlands in the 1980s and 1990s. It is built on three pillars: puberty-blockers (formally known as GNRH antagonists), cross-sex hormones and surgery. The goal was to alter the patient’s body to more closely match their sense of cross-sex identity, and thereby relieve their mental anguish. A pair of papers published in 2011 and 2014 by Annelou de Vries, one of the Dutch protocol’s pioneers, reported on the experiences of some of the first patients. They concluded that symptoms of depression decreased among patients taking puberty-blockers, and that gender dysphoria “resolved” and psychological functioning “steadily improved” after cross-sex hormones and surgery.

Transition ignition

Puberty-blockers do what their name suggests. The idea is that suspending unwanted sexual development can give patients time to think about their dysphoria, and whether or not they wish to pursue more drastic interventions. The same family of drugs is used to treat “central precocious puberty”, in which puberty begins very early. Some countries also use them to chemically castrate sex offenders. As with many other medicines used in children, the use of puberty-blockers in gender medicine is “off-label”, meaning that they do not have regulatory approval for that purpose.

Patients who decide to proceed with their transition are then prescribed cross-sex hormones. Males will see the development of breasts and alterations to how fat is stored on the body. Giving testosterone to females boosts muscle growth and causes irreversible changes such as deepening the voice, altering the bone structure of the face and the growth of facial hair.

Under the original Dutch protocol, surgery was permitted only after a patient turned 18, although as the cases of Ms Cole and Ms Hein show, in some places mastectomies occur at a younger age. Male patients can have artificial breasts implanted. More elaborate procedures, in which females have a simulated penis built from a tube of skin harvested from the forearm or the thigh, or males have an artificial vagina made in a “penile inversion”, are performed extremely rarely on minors.

In 2020 the National Institute for Health and Care Excellence (NICE), a British body which reviews the scientific underpinnings of medical treatments, looked at the case for puberty-blockers and cross-sex hormones. The academic evidence it found was weak, discouraging and in some cases contradictory. The studies suggest puberty-blockers had little impact on patients. Cross-sex hormones may improve mental health, but the certainty of that finding was low, and NICE warned of the unknown risks of lasting side-effects.

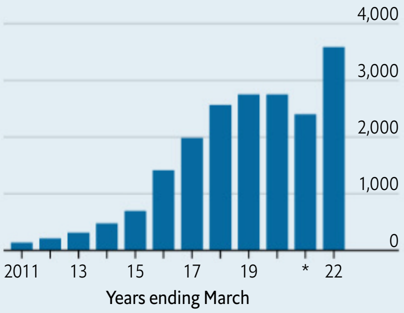
For both classes of drug, NICE assessed the quality of the papers it analysed as “very low”, its poorest rating. Some studies reported results but made no effort to analyse them for statistical significance. Cross-sex hormones are a lifelong treatment, yet follow-up was short, ranging from one to six years. Most studies followed only a single set of patients, who were given the drugs, instead of comparing them with another set who were not. Without such a “control group”, researchers cannot tell whether anything that happened to the patients in the studies was down to the drugs, to other treatments the patients might be receiving (such as counselling or antidepressants), or to some other, unrelated third factor.

The upshot is that it is hard to know whether any of the supposed effects reported in the studies, whether positive or negative, are actually real. Reviews in Finland and Sweden came to similar conclusions. As the Swedish one put it, “The scientific base is not sufficient to assess…puberty-inhibiting or gender-opposite hormone treatment” in children.

Two American professional bodies, the Endocrine Society (ES) and the World Professional Association for Transgender Health (WPATH) have also reviewed the science underpinning adolescent transitions.

Gender gyre 1

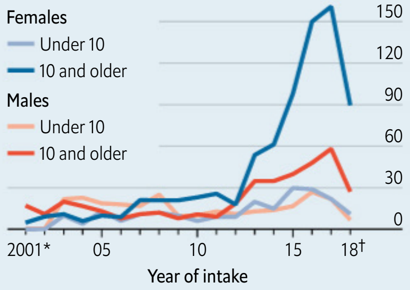
Britain, referrals to the Tavistock gender-identity clinic



*From July 2021, referrals to GIDS were restricted to a narrower group of practitioners
Source: Gender Identity Development Service

Boys to girls 2

Netherlands, patients seen at the VU Amsterdam gender-identity clinic



*1997-2001 †Intake restricted due to overwhelming demand
Source: “Children and adolescents in the Amsterdam cohort of gender dysphoria”, by M. van der Loos et al., *The Journal of Sexual Medicine*, March 2023

But ES’s review did not set out to look at whether gender-affirming care helped resolve gender dysphoria or improve mental health by any measure. It focused instead on side-effects, for which it found only weak evidence. This omission, says Gordon Guyatt of McMaster University, makes the review “fundamentally flawed”. WPATH, for its part, did look at the psychological effects of blockers and hormones. It found scant, low-quality evidence. Despite these findings, both groups continue to recommend physical treatments for gender dysphoria, and insist that their reviews and the resulting guidelines are sound.

One justification for puberty-blockers is that they “buy time” for children to decide whether to proceed with cross-sex hormones or not. But the data available so far from clinics suggest that almost all decide to go ahead. A Dutch paper published in October concluded that 98% of adolescents prescribed blockers decide to proceed to cross-sex hormones. Similarly high numbers have been reported elsewhere.

The reassuring interpretation is that blockers are being prescribed very precisely, given only to those whose dysphoria is deep-rooted and unlikely to ease. The troubling one is that puberty-blockers lock at least some children in to further treatment. “Time to Think”, a new book about GIDS by a British journalist, Hannah Barnes, cites British medical workers concerned by the latter possibility. They say patients received blockers after cursory and shallow examinations.

The Dutch researchers weigh both explanations. “It is likely that most people starting [puberty-blockers] experience sustained gender dysphoria,” they write. But, “One cannot exclude the possibility that starting [puberty-blockers] in itself makes adolescents more likely to continue medical transition.”

Perhaps the biggest question is how many of those given drugs and surgery eventually change their minds and “detransition”, having reconciled themselves with their biological sex. Those who do often face fresh anguish as they come to terms with permanent and visible alterations to their bodies.

Once again, good data are scarce. One problem is that those who abandon a transition are likely to stop talking to their doctors, and so disappear from the figures. The estimates that do exist vary by an order of magnitude or more. Some studies have reported detransition rates as low as 1%. But three papers published in 2021 and 2022, which looked at patients in Britain and in America’s armed forces, found that between 7% and 30% of them stopped treatment within a few years.

The original Dutch studies published in 2011 and 2014 were longitudinal—that is, they followed the same group of patients throughout their treatment. Yet three recent critiques published in the *Journal of Sex & Marital Therapy* nonetheless find fault with the studies’ data.

One of the new studies’ concerns is the small size of the original samples. The 2011 paper looked at 70 patients. But the outcome of treatment was only known for between 32 and 55 of them (the exact number depends on the specific measure). And even then, the final assessment of outcomes occurred around 18 months after surgery—a very short timeframe for a treatment whose effects will last a lifetime. (The first patient, “FG”, was followed for longer. In 2011, when in his mid-30s, researchers reported his feelings of “shame about his genital appearance” and of “inadequacy in sexual matters”. A decade later though, things had improved, and FG had a steady girlfriend.)

The critiques also suggest that the finding that gender dysphoria improved with treatment may have been an artefact of how the participants were assessed. Before treatment, female patients were asked to agree or disagree with such statements as, “Every time someone treats me like a girl I feel hurt.” This established their desire to be seen as male. After blockers, hormones and surgery the same individuals were asked questions on a scale originally developed for those born male. It offered statements such as, “Every time someone treats me like a boy I feel hurt.” Naturally, patients who preferred to be seen as male disagreed. In effect, the yardstick was changed in a way that might be seen as making positive outcomes more likely.

Finally, the original studies seem to have inadvertently cherry-picked patients for whom the treatment was most effective. The researchers started with 111 adolescents, but excluded those whose treatment with puberty-blockers did not progress well. Of the remaining 70, others were omitted from the final findings because they did not return questionnaires, or explicitly refused to do so, or dropped out of care or, in one case, died of complications from genital surgery. The data may therefore exclude precisely those patients who were harmed by or dissatisfied with their treatment.

In a rebuttal published in the same journal, Dr de Vries insists that the original papers found a significant improvement in gender dysphoria, the condition the protocol was designed to treat. She concedes that the switching of assessment scales is “not ideal” but says this does not imply the studies’ results were “‘falsely’ measured”. In response to worries about the relatively short follow-up, she noted that a study reporting longer-term outcomes is due “in the upcoming years”.

Newer longitudinal studies have been published since, but they have drawbacks, too. One published in January in the *New England Journal of Medicine* by Diane Chen of Northwestern University and colleagues looked at teenagers after two years of cross-sex hormone treatment. Although participants did typically report improvements in their mental health, they were small—generally single-digit increases on a scale that runs from 0 to 100. The study lacked a control group. Two of the 315 patients committed suicide.

What is more, whatever the merits of the Dutch team’s original research, the patients passing through modern clinics are strikingly different from those assessed in their papers. Twenty years ago the majority of patients were pre-pubescent boys; in recent years teenage girls have come to dominate (see chart 2 on previous page). The findings of older research may not apply to today’s patients.

The Dutch team’s approach was deliberately conservative. Patients had to have suffered from gender dysphoria since before puberty. Many of today’s patients say they began to suffer from dysphoria as teenagers. The Dutch protocol excludes those with mental-health problems from receiving treatment. But 70% or more of the young people seeking treatment suffer from mental-health problems, according to three recent papers looking at patients in America, Australia and Finland.

Despite the protocol’s caution, says Will Malone of the Society for Evidence-Based Gender Medicine, an international group of concerned clinicians, the reality is often the reverse, especially in America, with mental-health issues becoming a reason to proceed with transitions, rather than to stop them. “We are now told that if we don’t address young people’s mental-health problems caused by dysphoria with transition, they will kill themselves.”

Gender agenda

The original Dutch protocol emphasises the need for careful screening and assessments, as do official guidelines in most countries. But whatever the guidance, there are persistent allegations that it is not being followed in practice. “I had one 15-minute appointment before I was given testosterone,” says Ms Mosley. Many American patients contacted by *The Economist* reported similarly brief examinations.

The possibility that many teenagers presenting as trans could instead be gay has long been discussed. The Dutch study of 2011 found that 97% of the participants were attracted either to their own sex or to both sexes. In 2019 a group of doctors who resigned from GIDS told the *Times*, a British newspaper, of their worries about homophobia in some patients and parents. They worried that, by turning children into simulacra of the opposite sex, the clinic was, in effect, providing a new type of “conversion therapy” for gay children.

Both within America and without, whatever the loudmouths may claim, the vast majority of practitioners are simply trying to ease the genuine suffering of adolescents afflicted by gender dysphoria. But in America in particular the charged atmosphere has made it very difficult to separate the science from the politics.

European medical systems have not concluded that it is always wrong for an adolescent to transition. They are not trying to erase distressed patients. They have simply determined that more research and data are needed before physical treatments for gender dysphoria can become routine. Further research could, conceivably, lead to guidelines similar to those already in use by American medical bodies. But that is another way of saying that it is impossible to justify the current recommendations about gender-affirming care based on the existing data. ■

Why the future's most valuable brands will be B2B brands

Think of a brand and the chances are that the first one popping into your head will be a brand that you buy as a consumer. It could be a soft drink, a hamburger or a car, but the chances are that it springs to mind because of the years of investment that consumer marketers have devoted to putting it there.

Business to Consumer (B2C) brands are the glamorous end of the marketing profession with the biggest budgets, the highest-profile ads and the most awards. However, they're far from the only type of brand adding value to businesses. The biggest future opportunities can now be found elsewhere – among the Business to Business (B2B) businesses that were once dismissed as the drab cousins of B2C.

"I think brand is phenomenally important regardless of which sector you're in, says Brigitte Trafford, Chief Corporate Affairs and Marketing Officer for the London Stock Exchange Group (LSEG), a leading global financial markets infrastructure and data provider who's currently overseeing a significant brand simplification.

At the end of the day, people buy brands. They may be choosing you because of a particular product or solution, but there's always an emotional connection as well. It's really exciting to invest in that – and create a brand that will stand out in any category.

Brigitte Trafford
CMO, LSEG

Generating value for the world's biggest brands

BNP Paribas Asset Management is one of many long-established B2B businesses that are exploring more creative ways to bring their brands to life. "I'm asking my team to think about what we can do beyond straightforward display advertising," says Hilda Tingle, Global Head of Digital Marketing for BNP Paribas Asset Management.

We want to make sure that we're always top-of-mind for our clients and our prospects. A business like ours is really selling our intellectual capital, and we run year-round thought leadership activity like our Talking Heads podcast to build that capital.

Hilda Tingle
Global Head of Digital Marketing, BNP Paribas Asset Management

From Google to Microsoft to BNP Paribas, many of the world's most valuable brands are famous among consumers – but owe much of their value to the revenue they generate from other businesses. You don't need a consumer-facing dimension to be a valuable B2B brand, though. In recent years, the list of the most successful tech IPOs has been dominated by purely B2B businesses – evidence of the growing number of rapidly scaling companies that owe their success to the strength of their B2B brands.

"It's not just about visible things like the number of leads or the number of people who turn up to an event," says Kirsten Cox, VP EMEA Marketing for ServiceNow, which is experiencing exploding demand for its workflow automation platform.

It's about using marketing to make sure our brand is known for something before a salesperson walks through the door. It's about introducing new customers into the mix and creating opportunities for connections that didn't exist before. And because we're a Software as a Service (SaaS) business based on recurring revenue, we also have to keep customers engaged and motivated.

Kirsten Cox
VP EMEA Marketing, ServiceNow

How brand accelerates growth in B2B

A growing number of B2B businesses are investing in their brands – because they realise those brands have many different ways to repay them. "There are many different objectives that you can set for a brand campaign – from contributing to saliency and building market share, to supporting a price premium," says Luis Casado, Head of Worldwide Personal Systems Commercial Marketing for HP.

When we make big bets in terms of marketing investment in a country, we can see consideration move, and later on, we see market share respond. We're able to size that in terms of the budget that we allocate and revenue and profit that we ultimately receive, and our business leaders and Chief Finance Officer can see that link very strongly.

Luis Casado
Head of Worldwide Personal Systems Commercial Marketing, HP

For many B2B organisations, this is driving a change in role for marketing teams, with growing confidence leading to a louder voice on business and marketing strategy. "Rather than being a team that just delivers advertising, we want to ask: What is our strategy? How do we want to innovate? What are our objectives?" says Katie Cairns, Global Vice President of Integrated Media at SAP.

We want to get ahead of the curve on best practice, rather than being behind it.

Katie Cairns
VP Integrated Media, SAP

LinkedIn

You'll find more insights from senior marketing leaders at **www.linkedin.com/showcase/linkedin-collective/**

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The Belfast Agreement at 25

A good Good Friday

BELFAST

Northern Ireland's politics are now rarely deadly. But they are depressingly dysfunctional

On the cold April day in 1998 when the Good Friday Agreement was struck, George Mitchell told Northern Ireland's leaders that he had a dream. The former American senator had missed most of the first six months of his son's life in cajoling unionists and nationalists to reach a settlement. One day, he said, he wanted to sit with the boy in the public gallery of the Stormont Assembly, watching former enemies govern together. Fourteen years later he did just that. The ministerial statement they sat through was "dry as dust", he said. "But it was music to my ears, and I thought it wonderful to hear."

President Joe Biden, Rishi Sunak and other global leaders will soon be in Belfast, marking the deal's 25th anniversary on April 10th. There is much to celebrate. You can see the accord's traces in the city's very architecture: without the fear of bombs, there are glazed structures on nearly every street. You can taste them, too: where once a ring of steel kept out not only bombers but also diners, the Michelin guide recommends 18 restaurants. They have fostered friendship and even love. The Troubles forced people to stick largely to their own communities. Though most still live apart, many mix freely in the city centre.

The compromise that mostly ended 30 years of carnage has endured and even won over some who opposed it. Yet there are deep divisions still—and there is none of Mitchell's music, but plenty of dust, in the assembly's walnut-panelled chamber. Devolved government has been in abeyance for over a year, after its sixth collapse in all. Civil servants are keeping health, education and other services running, but cannot change laws or policies.

The deal was an astonishing achievement. Some of those who struck it could barely speak to each other. David Trimble, leader of the Ulster Unionists, then the largest unionist party, did everything he could to avoid speaking directly to Gerry Adams of Sinn Féin, the political wing of the Irish Republican Army (IRA), believing him to have been a key figure in the terrorist group. Mr Adams once tried to strike up conversation as they relieved themselves at the urinals. "Grow up," Trimble growled.

Yet Trimble led wary unionists to a generational compromise with nationalists, led by the avowedly non-violent John Hume, leader of the Social Democratic and Labour Party (SDLP), then the biggest on the nationalist side, whose thinking saturated the document. The two men would share the Nobel Peace Prize for their courage. Mr Adams showed courage of a different sort. Having failed to drive out the British at gunpoint, he oversaw the destruction of the IRA's arsenal, knowing he could be killed for doing so.

The agreement's genius lay in giving everyone just enough. Power-sharing between unionists and nationalists is compulsory. The leading party on one side provides the first minister and the other the deputy, and key votes in the assembly must be passed by majorities representing both. This protected the nationalist minority's interests, even while Northern Ireland remained British. The requirement to hold a referendum on uniting Ireland if there ▸▸

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was evidence nationalists would win allowed Sinn Féin to say it had a political path to its goal (though Northern Ireland was always unviable without majority support). Cross-border bodies blurred a previously militarised frontier, even if unionists retained a veto over their actions.

It was enough for almost three-quarters of a population worn down by incessant atrocities. In referendums six weeks later 71% of voters in Northern Ireland and 94% in the Republic of Ireland voted for the agreement. The Democratic Unionist Party (DUP) furiously opposed the deal. Now it is the main unionist group, the DUP cites it in defence of its interests. One of the most controversial changes for unionists was the transformation of the old Royal Ulster Constabulary, which was only 8% Catholic, into the Police Service of Northern Ireland, which is 32% Catholic. A government survey says that change has won the confidence of 86% of the population.

Tragic calculations

The accord undoubtedly saved many lives. How many, no one can know. But in nearly three decades of bloodletting, beginning in 1969, more than 3,500 people had been killed—nearly 400 of them even in the 1990s, when improved intelligence and security were constraining loyalist and republican paramilitaries.

The violence did not end at once—the deadliest single atrocity, a bombing in Omagh by dissident republicans, came in August 1998—and small loyalist and republican groups still occasionally kill. MI5, Britain's security service, still dedicates 20% of its resources to Northern Ireland. On March 28th it raised the threat level to "severe", meaning an attack is highly likely. But the scale of violence is minuscule after what went before (see chart 1). In the past 12 months, one person has been killed and 37 wounded by paramilitaries. There have been six bombings and 36 shootings. The police have recovered 1,000-odd rounds of ammunition.

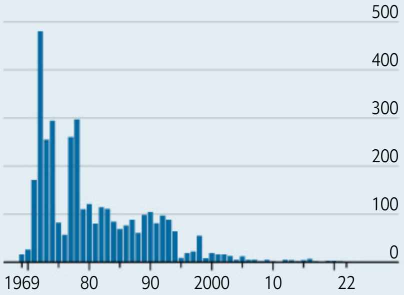
Peace has come at a price, paid largely by victims and their families. Michael Longley, a Belfast poet, encapsulated this in "Ceasefire", which draws on Homer's "Iliad". Collecting the battered body of his son Hector from Achilles, who has slain him, the elderly King Priam says: "I get down on my knees and do what must be done/And kiss Achilles' hand, the killer of my son."

What had to be done was to allow prisoners to walk free. Killers caught later would spend no more than two years in prison. Now the British government is going further still, in effect introducing an amnesty, saying it is time to move on.

A brake on carnage

Northern Ireland, killings related to sectarian violence

1



Source: The CAIN Project

Some have forgiven the unforgivable. Jude Whyte, whose mother was murdered by a loyalist bomb in 1984, sees no benefit in jailing her killer. Others cannot. Standing at the spot by the family cottage where his father was shot by the IRA in 1985, Sammy Heenan remembers the "haunting and dying screams" outside his bedroom window. He didn't welcome the accord: "I was absolutely devastated and distraught."

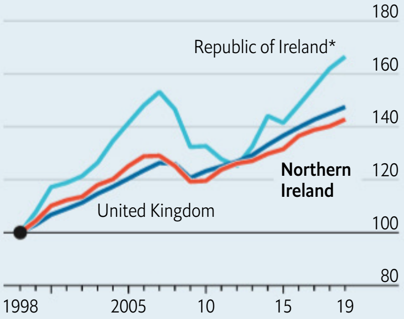
Mr Heenan is concerned, too, that his father's killers will become heroes. He believes a new generation is romanticising the bloody past. Young people have chanted "Ooh aah, up the 'Ra" (short for IRA) at concerts, in bars and even in the dressing room of the Irish women's football team. Sinn Féin's leader at Stormont, Michelle O'Neill, has said there was "no alternative" to the IRA's campaign of terror. In a poll last year seven in ten nationalist respondents agreed with her; in 1998 seven in ten Catholics said they had no sympathy at all for republican violence.

Many unionists foresee a further price: Irish unification. They complain that where they saw a settlement, Sinn Féin saw a staging post on its long march to a united Ireland. (According to a recent poll, 54% of unionists would now vote against the deal if they could.) But Mr Adams was always open about that. He said in 1998 that the Good Friday document was "concluding one phase of our struggle and opening up another". Confining agitation for unity to politics was the whole point.

North-south divide

GDP, 1998=100

2



Sources: ONS; Central Statistics Office, Ireland *Modified GNI

Yet despite Sinn Féin's electoral success—it long ago overtook the SDLP as the main nationalist party and came top in last year's elections to Stormont, ahead of the DUP—republicans are little closer to uniting Ireland than in 1998. Declining to murder their fellow citizens has made unity less threatening to more of the unconverted. But actual converts have been limited.

Nationalists are nonetheless more confident than at any time since Ireland's partition in 1921. They believe the tide of history has turned decisively in their favour, although even few republicans would expect to win a border poll now. Unionists are despondent. A succession of inept political leaders and the sense that their power is slipping away have fuelled fatalism.

Peace has surely been good for the economy, if not as good as you may have hoped. Between 1998 and 2019 Northern Ireland's GDP grew by 43%, a little less than that of the whole UK. But despite closer economic integration on the island, the Republic of Ireland's economy (on a measure stripped of the distorting effect on GDP of the Irish corporate-tax system) grew half as fast again (see chart 2).

Afloat again

Even so, to pace the modern streets of Belfast's Titanic quarter is to walk through the Northern Ireland that the agreement made possible. The site of the doomed liner's construction had by 1998 become a post-industrial wasteland. Now the 75-hectare site houses more than 100 companies, including global giants such as Citibank and Microsoft. The architecturally daring Titanic visitor centre has been more successful than the ship, attracting 7m visitors since opening a decade ago—an influx that would have been inconceivable when the city was fortified against attack. Nearby, in the cavernous Paint Hall Studio, "Game of Thrones" was filmed.

Across the road is the unremarkable scene of another drama, now almost seven years old: a huge hall where, in the early hours of June 24th 2016, it was announced that Northern Ireland had voted to remain in the EU, but the UK as a whole had chosen to leave. The Brexit vote critically destabilised a deal which had deliberately and helpfully blurred the border on the island.

To keep that border open, the British government ultimately decided to keep Northern Ireland in the EU's customs union and single market for goods, while taking the rest of the UK out. The resulting Northern Ireland protocol, part of the Brexit treaty, eased nationalists' discombobulation at Brexit, but dismayed unionists because it drew a border in the Irish Sea, making trade with Great Britain more difficult.

In February 2022 the DUP walked out of Stormont in protest. The Windsor framework agreed on by Britain and the EU has since replaced the protocol, but has been rejected by the DUP. Stormont is still not sitting. The powerful vetoes the agreement gave both sides have enabled a party with just 21% of the vote to stop a government being formed.

Numbers have always been critical to Northern Ireland. Its boundaries were carefully drawn a century ago to take in six of the nine counties in the province of Ulster, ensuring Catholics, who opposed partition, would be in a minority. But the Protestant majority has long gone. Last year's census confirmed that Catholics now outnumber Protestants, though they are not a majority either.

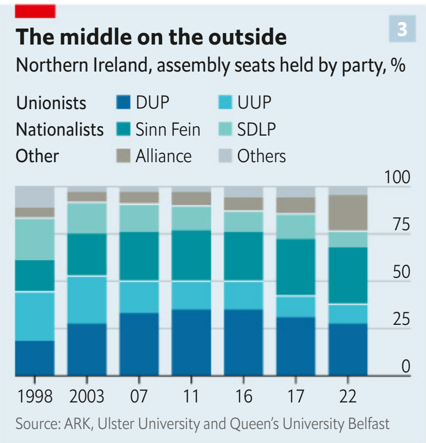
Paul Nolan, a social researcher, likens the publication of the census once a decade to football results announcing victory or defeat for one side or the other. But closer inspection of the latest showed something else: "The big winners were not unionism or nationalism, but those who wished to slip free of those moorings altogether...and with three teams now at play no one knows how this game will end."

Orange, green and in between

In 1998, just 7% of legislators were from non-tribal parties; today the centrist Alliance Party has almost 20% (see chart 3). Its rise is partly the child of the agreement, but now threatens that which gave it birth. The privileges the accord gave to two tribes in the assembly, unionists and nationalists, mean in effect that the votes of a third, centrists, don't count. That was theoretically indefensible in 1998, but made little practical difference; now it is an untenable absurdity. Moving to qualified majority voting, in which the backing of maybe 65% of all legislators is needed to pass a law—would prevent a return to the abuses of majority rule and give all members an equal say.

Even when functioning, devolved government has lurched between the plodding and the preposterous. The collapse before the latest one, which lasted three years, came in 2017 after the "cash for ash" scandal. Those in the know had piled into a green-energy scheme in which Stormont paid £1.60 for every £1-worth of fuel burned. An inquiry cleared anyone of corruption, but the incompetence revealed was shocking enough.

To Alban Maginness, an SDLP negotiator in 1998 and Belfast's first nationalist lord mayor, the agreement remains "the only way you can have a civilised form of politics here". Remarkably, he would like a referendum on unity in the next five years because he expects to lose. With the agreement ruling out another poll for seven years, it "might be best to get that out of the way and give us seven years of relatively stable government". But he admits that the price of stability is weak government.



The middle on the outside

Northern Ireland, assembly seats held by party, %

Source: ARK, Ulster University and Queen's University Belfast

Jonathan Powell, who as chief of staff to Tony Blair, then Britain's prime minister, was centrally involved in the 1998 talks, says that forced power-sharing "can't go on for ever". But to remove it just after the DUP has been overtaken by Sinn Féin would be a mistake, he adds.

Yet the agreement which operates today is already not the one agreed on in 1998. The number of legislators has been cut from 108 to 90. The sensitive justice ministry is allocated outside the accord's mechanisms to assuage unionist fears of an ex-IRA bomber being in charge of criminal justice. A technical change to how the first and deputy first minister are chosen has increased tribalisation—which is bad for Northern Ireland, but good for the DUP and Sinn Féin.

Stormont has been good at talking about problems. Agreeing on solutions is another matter. "It was a tremendous wasted opportunity," says Stephen Grimason, a former BBC journalist who spent 15 years as Stormont's chief spin doctor. "The DUP and Sinn Féin had no guts to take the decisions that had to be taken, particularly in health. Now it's maybe too late." (There is poignancy in his words: Mr Grimason is seriously ill.) Peter Donaghy, an analyst, calculates that 37.7% of people on National Health Service waiting lists have been there for more than two years, compared with 0.016% in England. The agreement may have ended terrorist killings, but bad government can be deadly in a different way.

The old abnormal

It is not only in Stormont that hearts still need softening. Northern Ireland remains a land of perpetual disputes, even over the name of the 1998 accord. Most unionists call it the unadorned Belfast Agreement (its official title), while nationalists and others prefer the grander Good Friday label. It has become one of the innumerable shibboleths—from how someone pronounces the letter H to whether their name is Sean or Billy—that mark people as Catholic or Protestant.

Most people still live by choice in segregated communities. Divisions linger in everything from sport to schools, and in popular culture (see Culture section). It is "a huge scandal for us as church leaders" that religious denomination is a badge of conflict, says Archbishop Eamon Martin, Ireland's most senior Catholic cleric.

Yet there have been myriad examples of inter-communal generosity. And some problems are shockingly simple to solve. "We still need to create opportunities for kids to get to know each other," says Gareth Harper, from the Peace Players, which uses sport to bring together young people who otherwise would never mix outside their communities.

The push and the pull

A.J. Conlon, a 17-year-old Catholic, and Rebecca Crozier, a 16-year-old Protestant, met through Peace Players and have come to cherish the freedom from sectarianism which it provides. Yet both expect to leave Northern Ireland. For Ms Conlon, an attack on her aunt and her awareness of people being burnt out of their homes are a spur to leave; Ms Crozier wants to "see what doors I could open for myself".

But their yearning may be less gloomy than it sounds. When Andrew Hassard cast his vote for the Good Friday Agreement in 1998, he was as young as anyone with a say could be: it was his 18th birthday. He too had no intention of staying in Northern Ireland. He left to study in England and then worked abroad. Twenty-five years later, he is back, running his own company selling psychedelically painted bicycles. Married with four children, he lives two miles away from his parents.

"Home is home," Mr Hassard says. "I worked around the world, but Northern Ireland is ultimately where I was drawn back to." The pull of a peaceful home—even such a stubbornly dysfunctional one—can be hard to resist. ■

Cyberwarfare

All in the mind

An interview with the commander of the National Cyber Force

"It is the deterrent rocket force of our age," gushed one columnist. "Cyber divisions are worth more than aircraft carrier[s] or nuclear weapons." He was referring to Britain's National Cyber Force (NCF), created in 2020 with a mission to "disrupt, deny, degrade" in cyberspace. Now the NCF is opening up to dispel such fantasies.

On April 4th it published "Responsible Cyber Power in Practice", which explains in 28 pages how Britain views the purpose and principles of "offensive cyber". On the same day it revealed its commander's identity. James Babbage has spent nearly 30 years at GCHQ, Britain's signals-intelligence agency. Mr Babbage gave his first interview to *The Economist*.

Less than a decade ago, he says, even insiders "tended to think about offensive cyber as a red button"—a potent weapon to pull out in the first hour of a war, or in response to some provocation. Now, he says, "both of those framings have lost quite a lot of their power". Instead NCF operations reflect "the doctrine of cognitive effect"—the idea that offensive cyber is less about turning the lights off in Moscow than a stealthy and subtle form of psychological warfare.

In essence, the NCF—staffed by GCHQ, MI6 and the armed forces—hacks computers and their networks. Today, that means everything from smartphones to fighter jets. Hacking can do physical damage, as America and Israel showed in the Stuxnet attack on Iranian nuclear facilities over a decade ago. It can also wipe data, as Russia has done prolifically in Ukraine. But the NCF sees its ultimate goal as influencing the behaviour of people or groups, whether criminals, terrorists or state adversaries.

Sometimes that means simple disruption, such as disabling a server or app that terrorists are using to communicate. But it usually calls for a more artful approach. "Covert techniques may be used to reach out to individuals who pose a significant threat," says the NCF. In 2018, for instance, the Pentagon's Cyber Command sent targeted messages to Russian hackers to dissuade them from interfering in that year's American midterm elections.

More often the aim is to stay in the shadows. "The intent is sometimes that adversaries do not realise that the effects they are experiencing are the result of a cyber operation," says the NCF. It finds the "greatest cognitive effect" comes from tinkering with an enemy's networks over time—what Mr Babbage calls "tilting the playing field imperceptibly". British cyber operations against Islamic State during 2016-17, for instance, not only hampered IS's communications, but also made its operatives distrust the orders sent over them. "Adversaries aren't very good at identifying and attributing UK cyber activity," boasts Mr Babbage, "and that's quite a good thing."

Inducing paranoia among enemies is a long-standing aim of covert action, says Rory Cormac, of the University of Nottingham. Historically, he says, MI6 "set people very discreetly against one another so that they destroyed each other". He points to Operation Flitter, a (failed) effort by the agency to induce a purge in the Soviet leadership in the 1950s. During Northern Ireland's Troubles spooks routinely sowed division within the Irish Republican Army, for instance by spreading rumours that one faction was plotting against another.

In many ways, cognitive effect is a repackaging of these dark arts. But one reason why the NCF is coming out of the shadows is to emphasise that it is a "responsible" cyber power. It says its operations are precisely targeted, calibrated to avoid escalation and accountable to ministers and Parliament—the Intelligence and Security Committee oversees operations. "When the Russians talk about psychological operations, they are much more often looking at population scale," says Mr Babbage. "When we're talking about cognitive effect, we're really talking about decision-makers, or usually quite small…groups."

Russia's invasion of Ukraine underscores the difference. Its cyber-attack on communication satellites inadvertently disrupted nearly 6,000 wind turbines in Germany. Russian digital propaganda has been crude and scattershot, using deepfake videos and fake news outlets. "Our currency really is the truth," insists Mr Babbage. "The wider our audience, the more critical it is that what we're putting out is true." Above all, he says, the Russian hackers waging information warfare appear to be disconnected from those disrupting Ukrainian computer networks. "That is exactly counter to our doctrine of cognitive effect, which is about bringing them both together."

Britain is still learning what that means in practice. In the past it often thought military cyber-attacks would be tactical—say, electronic warfare to take out a particular radar at a key moment. Now, says Mr Babbage, they seem most useful at the "theatre" level: influencing enemy generals in their headquarters, rather than colonels in the field. Two military lawyers sit within the NCF to advise on how the laws of war might apply.

The NCF refuses to discuss specific operations, citing the benefits of ambiguity. But it hopes that opening up about its doctrine will help shape others' behaviour. Its cognitive framing "is becoming something of a consensus" among allies, says Mr Babbage. "It's really important to help middle-ground states see that there's a real difference between responsible cyber power, that we advocate and practise, and…adversary cyber power". Meanwhile the NCF is a work in progress. It is developing versatile tools for use against a wide range of targets rather than just one. "Red buttons," says Mr Babbage, "become rusty buttons." ■

National Cyber Force

The name's Babbage. James Babbage

Nigel Lawson

The Iron Lady's chancellor

The tax reformer, privatiser and Eurosceptic died on April 3rd, aged 91

Nigel Lawson, the former Conservative chancellor of the exchequer who died on April 3rd, leaves two legacies. Britain's economy is still largely the one he transformed in the Thatcherite wave of privatisation, deregulation and tax reform in the 1980s. And the modern Conservative Party, transfixed by arguments over Europe and a rising tax burden, is packed with pretenders to his intellectual mantle.

As chancellor under Margaret Thatcher from 1983 to 1989, Lord Lawson eliminated a tax in each one of his six budgets. His record, however, was one of reforming rather cutting taxes, most notably by abolishing several higher rates of income tax and simplifying the system. (Subsequent chancellors have re-complicated it horribly.) In his memoirs, published in 1992, he lamented that during his chancellorship the share of national income the state took in tax fell only slightly—from 33% to 31%, according to the latest figures.

He was an enthusiast for the privatisation of nationalised industries, a process he launched as financial secretary to the Treasury and energy secretary before he became chancellor. After the sale of shares in British Telecom in 1984, he lauded "the birth of people's capitalism".

The government's goal, he said in his budget speech in 1986, was "the conquest of inflation and the creation of an enterprise culture". Neither was fully achieved. The "big bang" of financial deregulation breathed new life into the City of London but privatisations did not ultimately create the mass shareholder culture he and Thatcher hoped for. A successful policy of disinflation in the early 1980s—though at the price of mass unemployment, which Lord Lawson said Britain "can get along with"—gave way to rocketing inflation in the "Lawson boom" that followed his tax-cutting budget of 1988.

Marked man

Like many in his party, Lord Lawson grew more radically Eurosceptic over the years. Yet his advocacy of European integration of a sort had brought about his downfall. He had pushed for Britain's entry into the European Exchange Rate Mechanism, a system of fixed exchange rates: determined to control inflation, he anchored the pound to the German Deutschmark. Lord Lawson clashed with Thatcher's economic adviser, Alan Walters, who wanted Britain to stay out of the mechanism. Lord Lawson demanded that Walters be made to resign but Thatcher refused. The chancellor quit instead. Walters would follow. Little more than a year later, in November 1990, Thatcher herself was gone.

Arguments about Europe have consumed the party ever since. Lord Lawson remained part of them right up until his death. In 2016 he briefly became chair of the Vote Leave campaign, which successfully advocated Britain's departure from the EU. Though he was curious about ideas and his budget speeches were often long and dry, filled with technical details about monetarism, he believed that the true spirit of Thatcherism was a simple combination: free-market thinking, nationalism, self-reliance and "a dash of populism".

He was not shy of provocation. In later life he was a prominent climate-change sceptic as well as a fervent Brexiteer. His anti-EU pronouncements—from his home in France, where he sought permanent residency two years after the 2016 referendum, though he later left—irritated those who had backed Remain. His frequent presence on the BBC, arguing against the reality of man-made climate change or, alternatively, that a bit of warming was desirable, depending on the day, outraged environmentalists and scientists alike.

All sides of today's Conservative Party still lay claim to his (and Thatcher's) inheritance. Rishi Sunak, the prime minister, called Lord Lawson an "inspiration" after his death. Yet the exact shape of this legacy is contested. In a lecture in 2022 when he was chancellor, Mr Sunak said that many Conservatives gave only a partial account of Lord Lawson's time in office: their idol had waited to cut taxes until he had balanced the budget. In her tributes, Liz Truss, Mr Sunak's immediate predecessor, hailed Lord Lawson's tax-cutting zeal. The prime minister before her, Boris Johnson, hailed him as a "prophet of Brexit".

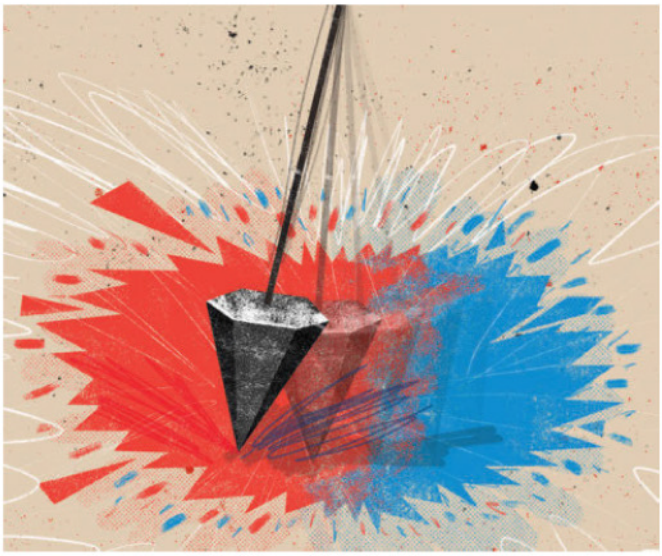
The difficulties confronting Conservatives in government today give the lie to simplistic claims to be Lord Lawson's economic heirs. The party is yet to find a way to combine voters' desire for better public services with its own small-state instincts. Ms Truss's brief, disastrous premiership, during which borrowing costs spiked after a surprise announcement of tax cuts, has quietened calls to shrink the state immediately, but few on the party's right are happy with the ratcheting-up of the tax burden to pay for better services.

And although Mr Johnson praised Lord Lawson's Euroscepticism, when prime minister he compared his own governing philosophy more to the views of Michael Heseltine, one of the "wets" more sceptical of the Thatcherite revolution than the true-believing "dries", such as Lord Lawson. Mr Johnson's embrace of a bigger state and regional redistribution, with a dash of populist bluster about "getting Brexit done", helped him win swathes of former Labour voters in the election of 2019.

Lord Lawson endorsed Mr Sunak over Ms Truss in last year's contest to become leader of the Conservative Party, arguing that he was the true heir to Thatcherism. Tax cuts required fiscal rectitude, he wrote, rather than an "insouciant attitude to the public finances". On the subject of how to combine that rectitude with fixing Britain's creaking health service, however, Lord Lawson's legacy is silent. ■

Bagehot | National Swing Man

Meet the exotic tribe that will determine the next election



PSEPHOLOGY THESE days resembles a trip to an old-fashioned anthropological museum, stuffed with the relics of mysterious tribes that have constituted the British electorate. In one glass case, we find Mondeo Man, the archetypal swing voter of the 1990s. In the next is Workington Man, a Brexit-backing rugby league fan who switched to the Conservatives in 2019. Newer specimens include Waitrose Woman, and her male friend, Spotify Dad—the disaffected middle classes abandoning the Tories. These people inhabit strange lands: the Red Wall, the Blue Wall, the Sea Wall and the Purple Patches.

Your pith-helmeted correspondent has uncovered another, who embodies the forces again reshaping the British electorate. Our specimen is male, but could just as easily be female. He is aged between 18 and 80. He may have a white-collar job, or a blue-collar one. He voted either Leave or Remain in the Brexit referendum. He lives somewhere—pretty much anywhere—in Britain. He is leaning towards Labour. He is National Swing Man.

National Swing Man reflects an older idea of the electorate: not of distinct tribes but of a single people whose party allegiances ebb and flow like the tide. In 1945 David Butler, a 20-year-old Oxford undergraduate, founded modern electoral science by applying the rudimentary statistics he honed on cricket scores to that year's general election. He turned raw ballot tallies into percentages, and then calculated the shift in parties' vote shares. He called this "swing". A striking pattern emerged: swing was similar across constituencies. Young Butler became a fixture of election-night television, divining the story of the night from a few early results, aided by his pendulous "swingometer".

Politicos identified ever more tribes as online surveys became cheap and abundant. Archetypes helped them decode an electorate that had become more complex and volatile than Butler's swingometer could capture. The Brexit referendum broke and remade party allegiances. Insurgent parties entered the field. Age and education replaced class as the best predictor of voting behaviour. As the country turned on itself, uniform national swing broke down: the Tories advanced in Leave strongholds and retreated in Remain areas. Butler, who died last November aged 98, was confounded. "The rules in the game of politics have changed very substantially from the world that I lived in," he remarked.

Things are shifting again. A national swing is again flowing through the electorate like an incoming tide. Under Sir Keir Starmer, the Labour Party leads the Conservatives by 46% to 26%, according to a YouGov poll published on March 31st. That is a Butler swing of 19 points since YouGov's post-election poll in 2019. Professionals have swung 17 points Labour's way and manual workers 16 points. By age, the swing to Labour looks like this: among 18- to 24-year-olds, five points; 25-49ers, 17 points; 50-64s, 19; over-65s, 18. Fixate on the tribes and you miss the bigger story.

National Swing Man does not think much about Brexit these days. Research by Jane Green, Geoffrey Evans and Dan Snow, who work on the British Election Study, which Butler initiated in 1964 at Nuffield College, Oxford, shows how the grand Brexit realignment has ossified. Between 2016 and 2019, the proportion of Tory support drawn from Brexiteers went from half to three-quarters, as Leavers were drawn to the party and some old Tory Remainers embraced Euroscepticism. Yet from 2019 to December 2022, those relative proportions remained fixed even as the Conservatives' overall support fell. The national tide, the YouGov data shows, is pulling both Leavers and Remainers towards Labour.

National Swing Man reflects the politics of consensus. Voters cite as their priorities the economy and health care; inflation and A&E queues bite everyone much the same. National Swing Man enjoyed the joke about Liz Truss and the lettuce. By the time the salad triumphed, eight in ten Britons disapproved of her. He disagrees with his neighbours on trans rights, but that won't be dictating how he votes: only 2% of Britons call it a political priority. If the Conservatives can mount a recovery, it will be on broad questions of leadership and economic competence rather than narrow cultural-wedge issues.

Our new-old specimen renders earlier anthropology a little out of date. In "Values, Voice and Virtue", a new book, Matthew Goodwin, an academic, argues that Labour lost the working class after being taken over by a cosmopolitan tribe he calls the New Elite. It is a familiar story from the Brexit years. But Mr Goodwin does not successfully reconcile it with Labour's 16-point lead over the Tories among such salt-of-the-earth types. Tribes can be misused by political ventriloquism. The strident views attributed by MPs to Red Wall Man on immigration and crime are also heard in any Surrey Conservative association.

Stonehenge via Stevenage

Yet handled smartly, tribes remain useful. They are a shorthand by which parties conduct internal debates over where to direct messaging and resources to crystallise a notional swing in the polls into a real one at the ballot box in the places that count.

A new report by Labour Together, a Starmerite think-tank, is such a case. It segments the electorate into six tribes, all of which are swinging to Labour. The party's strategy hitherto has been focused on regaining working-class voters in northern towns (the "patriotic left") which would grant Labour a small majority. The authors argue a more ambitious front, taking in politically undogmatic families in bellwether seats such as Stevenage (the "disillusioned suburbans"), would yield a large one. In other words, the mission is to find and capture the marginal voter in marginal constituencies through appeals to sound management of the economy and public services. For the past decade the electorate has been as mysterious as the folk who built Stonehenge. Now an undergraduate transported from 1945 would recognise it. ■

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The inner cricle of Olaf Scholz

Who does Germany's chancellor listen to?

BERLIN

Life inside the Scholzery

BERLINERS CALL it the Washing Machine. Yet lately the sound coming from the giant cube of concrete and glass where German chancellors work has not been a whirr of efficiency but a clank of discord. Whether against European neighbours, American allies or partners in Germany's own three-party coalition, the tight circle of advisers that has ringed Olaf Scholz since he took office 16 months ago seems to have a penchant for getting into fights.

Many of these troubles could have been avoided. When eastern Europeans railed at German slowness to back Ukraine last year, the chancellery responded generously, but so slowly that the impression of foot-dragging never lifted. Germany needlessly annoyed France, the closest of allies, by repeatedly failing to consult it before acting. The Biden administration bridled at the Scholz team's stubborn insistence that Germany would send tanks to Ukraine only if America did the same. In March the exasperation came from Brussels, after Germany suddenly blocked an environment bill. All along the Greens, liberals and Social Democrats inside Mr Scholz's government have bickered. Every few months he has had to pull them into a days-long private pow-wow to restore peace.

The problem lies partly with Mr Scholz's own high and dry style, and partly with the tightness of the ship he runs. In contrast to his predecessor, Angela Merkel, who tended to arrive at meetings first, leave last and in-between spend hours chatting across a wide network, the current chancellor likes his meetings short and narrow, preferably one-on-one. Unusually for a world leader, Mr Scholz expects to be home for an undisturbed dinner with his wife every day, followed by a good book and an early bed.

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Chief among the praetorian guard that surrounds the chancellor is Wolfgang Schmidt, a former lawyer who has been Mr Scholz's right-hand man for 20 years, starting with local politics in their hometown of Hamburg. So close is the odd couple—one big and bearded, the other bald and compact—that a columnist tellingly tagged them "Wolaf".

Mr Schmidt makes up for the chancellor's quiet reticence with equal and opposite ebullience, working phones and Berlin's bars until the early hours. But the broadness of Mr Schmidt's portfolio—he is chief of the chancellery's 600-plus staff, and has some oversight of national intelligence and communication strategy—can make him appear more of a fireman and salesman than a policymaker.

Others in Mr Scholz's core line-up include Steffen Hebestreit, his official spokesman; Jörg Kukies, his top economic adviser and go-to person for European affairs; and Jens Plötner, a smooth former diplomat who serves as his foreign-policy adviser. Although the inner circle is male-dominated, Mr Scholz is reputed to encourage women colleagues. His office manager, Jeanette Schwamberger, an economist who held the same job in his finance ministry, often joins her boss on foreign trips. Women head four of the chancellery's seven departments. Mr Scholz named Sarah Ryglewski, a Social Democratic MP, as a minister of state in the chancellery, and seeks her advice on parliamentary affairs and regional politics. His closest counsellor may be his wife, Britta Ernst, who has had a similarly long career in politics and local government.

There have been few leaks from Mr Scholz's chancellery. "They form a tortoise around him," complains one think-tank observer, speculating that the chancellor's long, unhappy experience as a relative outsider in his own party has taught him to be extra-cautious. Another lesson he may have learned is to keep more of an ear to the street than to the experts. Asked in a recent interview about Joe Biden, the American president, Mr Scholz tellingly responded that he felt a bond because both hold a special concern "for the middle class". Mr Hebestreit, his spokesman, says his boss prefers opinion to advice.

But the tightness of the chancellor's circle can both make it impermeable to useful information and create a siege mentality. His lieutenant, Mr Schmidt, despite posing as a genial friend of the press, tends to blame journalists for twisting the truth rather than admit that the chancellery might have communicated poorly or put forward flawed policies. The fact that Mr Schmidt himself holds so much sway could be a problem. Foreign-policy advisers have long pleaded for the creation of a National Security Council to bypass systemic rivalry between the chancellery and the foreign ministry, a change acutely needed as Germany is increasingly forced to abandon its traditional wallflower stance in geopolitics. But talks broke down last month over where to house such a council and who should run it. One foreign-ministry diplomat mutters, "We can't have Schmidt making security policy, too."

A bit of extra attention could also help to fend off troubles inside the coalition over domestic policy, where strains are inevitable between the tight-fisted Free Democratic liberals who run the finance ministry and the Greens who run economic policy. "Merkel had dedicated people whose whole focus was to make sure her coalition partners were happy," says an official who served the previous government. "No wonder Scholz has problems."

Intimates of the chancellor are more forgiving. Despite the sharpest regional crisis in decades, they say, Germany's international alliances have grown stronger over the past year, not weaker. Although Mr Scholz's three-headed coalition is the most complex to date in a German national (as opposed to state) government, very few people believe that it is going to fall. And in public opinion the chancellor has managed to hold the centre, repeatedly proving to have a better sense of Germany's pulse than his critics. ■

Turkey

Kingmakers and scapegoats

KIZILTEPE

Turkey's Kurds will play a critical role in next month's elections

NILUFER ELIK YILMAZ'S tenure as mayor of Kiziltepe, a town in Turkey's south-east, was short-lived. In November 2019, seven months after she was elected, Mrs Yilmaz, a member of the People's Democratic Party, Turkey's main Kurdish one, was ousted by the interior ministry and replaced by a government appointee. Weeks later, she was locked up on terrorist charges. Freed on parole over a year later, she was recently sentenced to more than six years in prison, pending appeal. Across the Kurdish south-east, stories like hers are the rule, not the exception. Of the 171 mayors elected on the HDP's ticket in the past decade, some 154 have been dismissed or prevented from taking office. Dozens have been arrested. "This cycle has to end," says Mrs Yilmaz. But that all depends on Turkey's upcoming elections.

Turks will elect parliament and president on the same day, May 14th. The outcome may hinge on the Kurds. Recent polls suggest that neither the governing coalition, composed of the Justice and Development (AK) party and the Nationalist Action Party (MHP), nor the main opposition bloc, the Nation Alliance, will be able to hold a parliamentary majority. The HDP can expect to take at least 10% of the vote, which could make its MPs kingmakers.

Its voters may play an even bigger role in the presidential poll. Instead of putting forward its own candidate, the HDP is backing the Nation Alliance's contender, Kemal Kilicdaroglu, head of the Republican People's Party (CHP), against Turkey's president, Recep Tayyip Erdogan. The aim, says Selahattin Demirtas, the HDP's former leader, writing from prison, "is to put an end to the Erdogan regime and give democratisation a chance".

For Kurdish leaders to endorse a CHP leader for president right now shows just how badly Mr Erdogan and his AK have fallen out with the country's biggest ethnic minority. For decades the CHP, the party of Turkey's old secular establishment, denied that a separate Kurdish language and culture even existed. Well into the 2000s, the party still opposed any concessions. Mr Erdogan and his AK were much more accommodating, offering the Kurds new cultural rights, using appeals to Islam to win over Kurdish conservatives, and even launching peace talks with the Kurdistan Workers' Party (PKK), an armed separatist group. This earned them a decent share of the Kurdish vote.

Things began to change in 2015, when Mr Erdogan washed his hands of the peace talks and the PKK, emboldened by the success of its American-backed offshoot in Syria, launched an urban insurgency across the south-east. Mr Erdogan's government responded with deadly force, then with a blanket crackdown against Kurdish nationalists, including the HDP, which most Turks consider the PKK's political wing. Mr Demirtas and several other MPs, as well as hundreds of other HDP politicians and activists, were thrown behind bars on mostly trumped-up terrorism charges. Many Kurds believe the HDP's earlier refusal to back Mr Erdogan's plans for an executive presidency was another reason for the sweeping crackdown.

The government has since turned even more hawkish, sacking Kurdish mayors en masse, in effect disfranchising millions of voters. It attacked the PKK and its affiliates in Syria and northern Iraq. "The AK has moved further away from the Kurds," says Vahap Coskun, an academic. "And the CHP has moved closer." What this spelled for Turkish politics became clear in the local elections of 2019, when Kurdish votes propelled CHP candidates to victories in mayoral races in Istanbul, Turkey's largest city, and Ankara, the country's capital.

The HDP and its voters are not just kingmakers but scapegoats. Mr Erdogan and his ministers, coddled by a complacent media, have pushed the HDP to the margins of politics. Leading news channels treat HDP politicians as untouchables. Dozens of HDP members face prison terms on charges dating back to 2014, when protests against the government's policies in Syria erupted in the south-east.

A separate case, now before Turkey's constitutional court, may see the party closed down and its leading members, including Mrs Yilmaz, banned from politics for several years. A verdict in this case may be reached as soon as April 11th. To sidestep a possible ban, the HDP recently decided to contest the coming elections under the banner of another party, the Green Left.

Over the years, by refusing to speak up for the Kurds or to speak with a single voice, the opposition was complicit in the government's persecution of them. The CHP backed both the decision to strip HDP parliamentarians of immunity and its military operations in Syria. Now the doveish Mr Kilicdaroglu has at least expressed remorse about the CHP's past mistakes and offered to work with the HDP if elected, making him the candidate most palatable to the Kurds, says Mr Coskun. But the CHP's main alliance partner, the Good party, a group dominated by nationalists, takes a much harder line, refusing so much as to meet representatives of the HDP.

Mr Erdogan is keen to deepen these cracks in the alliance, hoping to drive some nationalists away from the opposition and into his own camp. Ahead of the election, he has doubled down, claiming that by courting the HDP, which he denounces as a PKK front, the opposition has teamed up with terrorists. The opposition needs the HDP and its voters to win the presidency. Mr Erdogan needs them to pep up his scaremongering campaign. ■

Finland's election

Back to grey

Finland joins NATO but boots out Sanna Marin

It became the defining image of the Finnish election campaign: Sanna Marin, the Social Democratic prime minister, and Riikka Purra, leader of the hard-right Finns Party, wagging their fingers furiously at each other during a televised debate. Yet in the end the winner was neither Ms Marin nor Ms Purra, but the third candidate in the debate. Petteri Orpo's centre-right National Coalition party narrowly won Finland's general election on April 2nd, taking 20.8% of the vote to the Finns' 20.1% and the Social Democrats' 19.9%. Mr Orpo now faces the tricky task of forming a governing coalition.

The 37-year-old Ms Marin, who has been prime minister since 2019, won international fame for her strong support for Ukraine and decisiveness in bringing Finland into NATO: on April 4th it became the 31st member of the alliance. Although her image was coloured by an embarrassing leak last summer of home videos showing her dancing enthusiastically with friends (she took a drug test to squash rumours), Finns had come to take Ms Marin seriously after her solid handling of covid policy. "She came in as a young prime minister in a difficult situation, but she was very credible as a leader throughout the pandemic," says Teija Tiilikainen, a political scientist.

Yet Ukraine and NATO were barely mentioned during the campaign, since almost all Finnish parties now agree on them. The National Coalition party is at least as firm on defence as the Social Democrats; two of its new MPs are former generals. And the Finns Party, unlike many hard-right populist outfits in Europe, has few traces of sympathy for Russia. It prefers scepticism towards the European Union and climate policy, and hostility to immigration.

The battle was mostly fought on other grounds. Fiscally conservative sorts, Finns worry about government debt, which rose to 75% of GDP during the pandemic. Rising defence spending will exacerbate that. Mr Orpo promised to bring the deficit down by cutting social spending; Ms Marin had promised to raise it.

The election displayed a new phenomenon for Finns: tactical voting. Both the Social Democrats and the National Coalition urged sympathetic supporters of smaller parties to pick them instead, in order to increase their chances of coming first and leading the government. As a result, big parties got bigger and most small ones shrank—the opposite of the trend of fragmentation observable in most other European democracies.

So while Ms Marin did reasonably well, increasing the Social Democrats' vote share, the overall result was a shift to the right. In his search for a majority, Mr Orpo's most straightforward choice would be to form a solidly right-wing government with Ms Purra. If that fails, he will have to try to create a centrist "red-blue" government with the Social Democrats.

The policy implications of the hard-right option are hard to predict. The Finns Party has moderated its image somewhat. In 2019 one of its campaign advertisements depicted a fiery ancient monster rising up to avenge the Finnish people on their corrupt leaders. This year it pleaded for the country to burn domestic peat to alleviate energy shortages.

On April 5th Ms Marin announced that she will be stepping down as leader of the Social Democrats in the autumn. Her party will need to bide its time and see how Mr Orpo's negotiations work out. Should he fail to form a coalition, it may yet get a chance to try again. But Finland is losing its international figurehead. It was unusual for such a stoical country to have a flamboyant leader. Mr Orpo represents a reversion to the norm. ■

Evan Gershkovich

On March 29th Evan Gershkovich, a correspondent for the *Wall Street Journal*, disappeared during a reporting trip to Yekaterinburg, Russia's fourth-biggest city. The next day Russian security services revealed that they had arrested him on spying charges. That Mr Gershkovich, an American citizen, is fully accredited to report in Russia seems to have made no difference. The newspaper says it is deeply concerned for his safety. Despite appeals from President Joe Biden, the secretary-general of NATO and many other governments, as well as newspapers across the world, there has been no contact with Mr Gershkovich, a talented reporter with a deep love of Russia. The arrest, the first of a Western journalist on espionage charges in Russia since the end of the cold war, will worsen already terrible relations between Russia and America. The Kremlin may intend to use Mr Gershkovich as a bargaining chip to secure the release of Russians imprisoned in America or Europe, but there is still no confirmation of this.

Gays in Ukraine's armed forces

A battle yet to be won

KYIV

But there are signs of progress

When Pasha Lagoyda joined the Ukrainian army in 2021, he didn't tell anyone he was gay. In his first weeks his room-mates at training camp found some "spicy texts", as he puts it, and he was bullied. "There was aggression. They called me a faggot—all that stuff."

As his fellow recruits got to know him better, the intimidation died down. Now Mr Lagoyda is serving on the front line and all the 180 people in his unit know he's gay. He posts selfies looking fit in his camo fatigues with washboard abs and immaculate stubble. He is also a member of LGBTIQMilitary, an Instagram account that features LGBT people in military service. It even has a link to buy merch: mugs and cloth patches depicting an armoured unicorn breathing fire. "Wherever I serve," says Mr Lagoyda, "everyone tells me: 'Because you are here at war, in principle I have no right to call you gay or a faggot; you are just a person who is protecting us on an equal footing'."

He is not alone. Thousands of gay people are serving in the Ukrainian armed forces, often sporting a rainbow badge next to the Ukrainian blue and yellow on their uniform. LGBT groups have also been at the forefront of humanitarian volunteering. Their visibility has led to a sea-change in Ukrainian society.

Homosexual sex was decriminalised after the Soviet Union broke up in 1991, but when Kyiv's first Gay Pride parade was held in 2013 only a few dozen people were brave enough to ignore the threat of skinhead violence. Even after Ukraine's revolution of 2014 and the reforms that followed, legislation protecting gay rights lagged behind. Despite years of campaigning, for example, parliament has still not amended Ukraine's hate-crime laws to include acts against gay people.

War changes everything. Last summer, the parliament finally ratified the Council of Europe's Istanbul convention on violence against women, after a decade-long delay, caused by the objections of church groups to the use of "gender" in the text. It is now drafting a bill that would give same-sex couples the right to register civil partnerships, something that was unimaginable even a year ago.

Inna Sovsun, the MP who introduced the bill, says she was encouraged when a petition last summer calling for same-sex marriage to be legalised was signed by over 25,000 people, meeting the threshold for presidential consideration. Polls have shown that more than half of Ukrainians think gay and bisexual people should enjoy equal rights. Ukraine's president, Volodymr Zelensky, has signalled support for a civil-partnership law, but his government has yet to make it a priority.

On an equal footing

Protecting the rights of gay people in the military gives a big push for the bill. Civil partnerships would let same-sex couples make medical decisions if a partner is wounded; if one is killed, the survivor would be able to bury him or her according to their wishes, inherit with the same tax advantages that marital spouses have, and receive state compensation for the loss. "It's something many people dream about," says Mr Lagoyda. "If something happens to me, God forbid, I want my boyfriend to be able come to the intensive care or take my body away."

Sofiia Lapina, head of Ukraine Pride, an activist group, argues that the shift in attitudes on gay issues partly reflects Ukrainian aspirations to be culturally and politically closer to Europe. It is also a way, she adds, for Ukrainians to oppose Vladimir Putin's repressive Russia, which has outlawed "homosexual propaganda" and characterises the war in Ukraine as an existential battle against the West's supposed promotion of gay marriage, rampant paedophilia and gender-neutral pronouns.

Ukrainian LGBT groups have documented how lesbian and gay people in Russian-occupied territories have been hunted down, raped, detained and humiliated. Tattoos of gay symbols are as much a red flag to Russian troops as Ukrainian tridents. Transgender people there are afraid to go out into the streets. Ms Lapina says "Ukrainians have begun to see more clearly that hate in any form—racism, homophobia—is basically Russian propaganda." ■

Montenegro

A Balkan boss falls

Milo Djukanovic is ousted

After a third of a century the blade had blunted. Nicknamed *britva*, "the razor", because of his political sharpness, Milo Djukanovic finally lost the presidency of Montenegro on April 2nd, when he was resoundingly defeated in an election by Jakov Milatovic, a relative newcomer. Mr Djukanovic first tasted power in 1989, when Mr Milatovic was two years old. In 1991 he became prime minister. Until his party lost a general election in 2020 he was the undisputed master of Montenegro.

Back in 1989 Mr Djukanovic, now 61, was a protégé of Serbia's leader, Slobodan Milosevic. Two years later he cheerled as Montenegrin units of what was still Yugoslavia's army attacked the port of Dubrovnik, in neighbouring Croatia, which was breaking away. He then backed a referendum for Montenegrins to stay united with Serbia, as the last components of Yugoslavia. But in 1997, when protests against Mr Milosevic rocked Serbia, Mr Djukanovic turned coat, emerging as a Montenegrin nationalist. In 2006 he steered his country to independence. Montenegro joined NATO in 2017.

One of his successes was to keep his multi-ethnic country of 617,000 people at peace. But he was never able to heal the historic division between those who saw Montenegro's identity and future as tied to Serbia and those who did not. He has also long been dogged by allegations of cronyism (which he has always denied). When he leaves the presidency next month he will lose immunity from prosecution, which his enemies may well call for.

Mr Milatovic, aged 36, an Oxford-educated former minister of the economy, was backed by pro-Serbian, pro-Russian parties—and by many on the other side of that gulf, too. "I think the vote was more anti-Djukanovic rather than pro-Milatovic," says an analyst.

All eyes are on the general election due in June. Mr Milatovic is a pragmatic centrist bent on mending the economy. His new party, Europe Now!, is expected to do well. He wants Montenegro to join the EU by 2028, which may be optimistic. He has said little about Ukraine and will be friendlier towards Serbia than Mr Djukanovic was. The government has more power than the president, so the next election may be the real harbinger of Montenegro's future.

America's energy transition

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REBUILDING AMERICA'S ECONOMY

THE FUTURE catches you in unexpected places. Drive down Interstate 95, the highway running along America's Atlantic coast, into south-eastern Georgia and you will find signs and rest stops named after pecans and peaches. Take the local roads to Woodbine, an outpost so far from traditional industrial hubs that a state development officer, a proud Georgian, confesses that: "The nearest civilisation there is Florida." In this unlikely spot you can get a glimpse of America's clean-energy future.

Plug Power, a pioneer in energy technology, provides warehouses operated by Walmart and Amazon with forklifts run on hydrogen. Plug is building one of the world's largest plants to make liquid hydrogen. When your correspondent visited, workers were removing tarps from giant electrolysers, which will use clean energy to crack water into its constituents, hydrogen and oxygen. Sanjay Shresta, Plug's chief strategy officer, says the output will be able to power 10,000 of those forklifts a day. Local officials helped with site selection and permitting, he explains, but the Inflation Reduction Act (IRA), a climate-focused law passed by Congress last August, has had "a transformational impact" on the prospects for clean hydrogen.

Mention of that project gets Ali Zaidi, the White House's national climate adviser, leaping to his feet in his West Wing office. Pointing to a chart showing clean-investment trends outperforming forecasts, he says: "We're seeing people make bets on America even ahead of where our ambition might have been." Since President Joe Biden took office, thanks to three recent laws, the Bipartisan Infrastructure Law (BIL), the CHIPS Act and the IRA, firms have announced about $200bn in investments into everything from batteries and electric vehicles (EVs) to renewables and hydrogen. Some $65bn of that has come just since the IRA was signed into law last August.

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Jennifer Granholm, America's secretary of energy, argues that the country is well on its way to becoming "a global energy superpower". America's oil exports, which hit a record high last year, have kept world markets supplied, and its exports of liquefied natural gas helped rescue Europe during the Russia-induced energy shock of the past year. Mr Biden came into office with an anti-fossil-fuel stance, but concerns about energy security have led to a more open posture towards Big Oil.

Witness his approval last month of Willow, an Alaskan oil project that became a *cause célèbre* of anti-fossil-fuel activists. Senator Lisa Murkowski, a Republican from that state, credits his "much more pragmatic" approach to the impact of Russia's invasion of Ukraine on energy markets. That pragmatism is enshrined in the fine print of the BIL and IRA. The laws offer subsidies for decarbonisation technologies well beyond wind and solar to include carbon capture and sequestration (CCS) and hydrogen made from fossil fuels.

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They are specifically designed to persuade the oil and gas industry to clean up its act.

A year ago Ms Granholm addressed energy bosses in Houston at CERAWeek, the country's main oil and gas conference, just as America was imposing sanctions on Russia. The oilmen did not respond well to being scolded as climate villains by the administration at the same time as it was asking them to produce more oil to make up for global shortfalls. She returned to Houston a few weeks ago for the same conference but this time her innovation-focused speech "really electrified the audience", says Daniel Yergin, who chaired the event.

"We have provided a suite of carrots to make the United States irresistible," says Ms Granholm. Sure enough, energy firms from around the world are accelerating their investment plans in America, even as they express private doubts about the efficiency of industrial policy. They also worry about the strings Congress has attached, such as woolly social-justice provisions and onerous domestic-sourcing rules.

The IRA's climate-related provisions provide some $369bn in tax credits and other direct government funding over the next decade for energy and infrastructure. Some of the tax credits (such as the lavish $3/kg production credit on offer for clean hydrogen) are uncapped by Congress, so if investors flock enthusiastically—as early signs indicate they are, from around the world—the IRA's public climate spending could exceed $800bn. Add in the likely catalytic impact on private capital, says Goldman Sachs, a bank, and the figure soars to $1.6trn in decarbonisation investments over that period (see chart 1).

America's energy system is at an inflection point. Last year power generated from renewable energy surpassed the total generated from coal for the first time (see chart 2). That trend looks likely to accelerate sharply. The unsubsidised costs of wind and solar are plummeting below the cost of coal generation, and tax credits for their deployment will soon flow freely.

The IRA is unlikely to be overturned by a future Republican Congress. Senator Chris Coons, a Democrat from Delaware, reports that, despite noisy complaints from Republicans in the House of Representatives, he is "not hearing from Republicans in the Senate that they want to completely repeal it in 2024", in part "because Houston benefits as much as Chicago, if not more".

A report by Climate Power, an advocacy group, found that over 100,000 new jobs were announced in 31 states between the passage of the IRA and the end of January, with the lion's share of the 90-plus clean-energy projects in conservative states. Georgia, hardly a liberal stronghold, came top with over $15bn in investment. Bryan Fisher of RMI, a clean-energy non-profit, estimates that more than 75 decarbonisation projects worth $1bn or more are under development in deep-red Texas and Louisiana thanks to BIL and IRA inducements. ExxonMobil, once a highly climate-sceptical company, is now heading a $100bn project for CCS along the Gulf of Mexico.

America's new approach to energy rightly tackles the climate externality previously neglected by federal policy while mostly leaving the picking of specific technology winners to the private sector. Thanks to the insistence of Senator Ron Wyden, a wonkish Democrat from Oregon, the tax credits for clean power will shift to a technology-neutral approach. A geothermal entrepreneur gushes that his hitherto-overlooked technology will finally get a fair chance. As Mr Wyden explains: "This ties together markets with choice and competition...the more you reduce carbon emissions, the more tax credits you earn."

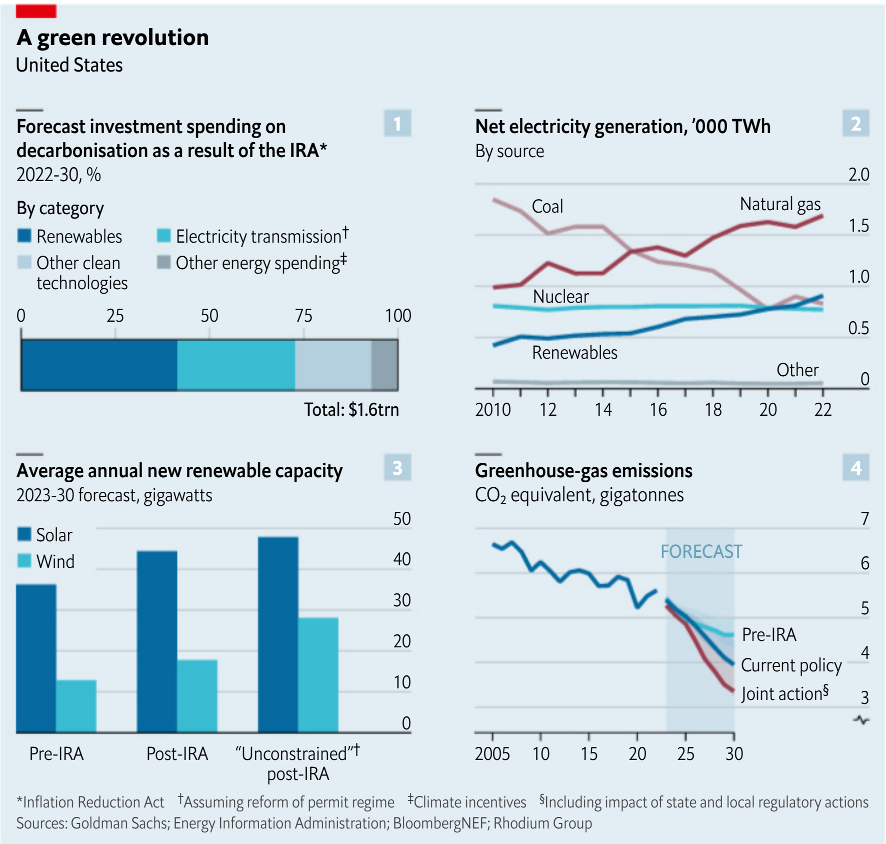
New pragmatism

American law requires official support for low-greenhouse-gas (GHG) hydrogen made from renewables, nuclear power and fossil fuels with carbon capture. Some activists are hostile towards carbon-capture technologies, which they believe are giving Big Oil a longer lease on life, but UN climate experts have said they are needed to achieve long-term climate goals. America will support all forms of carbon capture capable of making it the global leader in this nascent area. BloombergNEF (BNEF), a research firm, reckons that merely the projects announced so far will propel America to a sixfold increase in its CCS utilisation by 2030.

Also encouraging are early indications that the Biden administration wants to soften problematic protectionist provisions written into the new laws. One worry was that the desire to combat Chinese domination of vital supply chains will lead to an overreaction, with stringent tax guidance forcing American firms to domesticate supply chains radically and quickly or risk losing out on subsidies. Proposals are also making the rounds in Congress for an anti-China border tax on carbon that could become a form of protectionism.

But there are further signs of pragmatism. To avoid a tit-for-tat battle over carbon border taxes, European and American trade officials are discussing forming a carbon club of economies that would levy tariffs on steel and aluminium based on the GHG-intensity in their production.

On March 31st the Treasury unveiled rules governing the tax credits available for EVs. If these had been written in the most stringent way, they would have made it much harder to earn tax credits for new EV models. In the event, the proposal widened eligibility such that it would make it easier to source some key inputs from countries lacking the comprehensive free-trade deals long enjoyed by Canada and Mexico. The rules were denounced by Senator Joe Manchin, an influential Democrat from



A green revolution

United States

Forecast investment spending on decarbonisation as a result of the IRA* — 2022-30, %

Net electricity generation, '000 TWh — By source

Average annual new renewable capacity — 2023-30 forecast, gigawatts

Greenhouse-gas emissions — CO_2 equivalent, gigatonnes

*Inflation Reduction Act †Assuming reform of permit regime ‡Climate incentives §Including impact of state and local regulatory actions

Sources: Goldman Sachs; Energy Information Administration; BloombergNEF; Rhodium Group

West Virginia favouring much stronger protectionism, as “horrific”.

Weighing against those arguments are three big impediments. The first is bureaucracy. Mr Coons argues that “the next two years are all about implementation before the 2024 election…speed is very important now.” Passing the IRA and its sister laws may have required Herculean efforts, but that pales in comparison with turning those laws into reality.

Hundreds of billions of dollars of investment hang in the balance as the Treasury, with advice from the Department of Energy and others, decides how squeaky green projects must be to get the full hydrogen tax credit, how exactly to apply environmental and social-justice provisions in determining winners of grants, and other politically fraught decisions. Among energy-industry types, enthusiasm for the coming bonanza is tempered with concerns about the opacity and complexity of the rules involved. And there could be unintended consequences: some environmentalists are abuzz with rumours that investors are already chopping down forests in order to set up subsidised solar projects.

Old obstacles

The second snag is permitting. “We can be the superpower of all energy sources,” says Ms Murkowski, but for that to happen, “we’ve got to have permitting that makes sense.” BNEF reckons that over 1,000GW of power projects are awaiting access to the grid, with renewables making up the lion’s share of capacity waiting in the interconnection queues (see Technology Quarterly). IRA spending could boost annual construction of solar and wind capacity over the next decade by half above the non-IRA baseline, but failure to fix permitting constraints would slash that potential gain in half (see chart 3 on previous page). The conventional wisdom is that no ambitious reform is possible with a presidential campaign due to start in earnest this autumn.

Yet there are surprising signs of progress. Mariannette Miller-Meeks, a Republican congresswoman from Iowa and vice-chair of the Conservative Climate Caucus, says that “one of our top priorities is permitting” and extends an olive branch: “We need to partner with the other side.”

A coalition of dozens of business groups led by the US Chamber of Commerce issued a letter on March 27th calling the current permitting quagmire “the single biggest obstacle” to building infrastructure, and demanding that reforms be enacted by the end of summer. The coalition stretches from the American Petroleum Institute to the Solar Energy Industries Association. On March 30th House Republicans passed a fossil-friendly energy bill. It will not succeed (Mr Biden vows to veto it) but its permitting proposals could be carved out with bipartisan support.

The bigger obstacles to reform have typically come from the left, which has armies of lawyers skilled in delaying projects until they become unviable. Yet change may be coming. Congressman Scott Peters, a Democrat from deep-green California, has been pushing his colleagues to accept that “climate action involves building a lot of things…this is a break-the-glass moment.” He dares to say that even the National Environmental Policy Act (NEPA), which is held sacred by many environmentalists, needs to be updated: “You can’t sit on this old law as Biblical.”

The combination of climate crisis and “policy opportunity” requires a change in approach if the “deployment challenge” is to be tackled, acknowledges Manish Bapna, head of the Natural Resources Defence Council, an influential American environmental group. It wants reforms in the way projects are approved at state and local level, for example through the designation of “go” and “no go” zones. While upholding the need for NEPA, the group accepts the need to implement it more efficiently. “This is not just about playing defence to stop bad projects, but also about going on the offence to build,” says Mr Bapna.

John Podesta, the supremo co-ordinating Mr Biden’s climate and energy efforts, confessed to the CERAWeek audience that “permitting has never been a top priority for senior officials in the past—and I’ve been in three White Houses.” He revealed that the administration plans to invoke provisions added to the Federal Power Act in 2005, but never fully exercised, that allow certain transmission lines to be put on a fast track. Asked about this, Ms Granholm shows off a whiteboard in her “war room” listing the most important transmission lines pending approval: she updates the White House regularly on their progress.

The third potential spoiler is the fact that the IRA is full of incentives but almost entirely devoid of regulatory mandates. Fresh analysis from the Rhodium Group, a research firm, shows that America’s current approach, while better than doing nothing, will fail to achieve Mr Biden’s goals for decarbonisation, which are linked to the UN’s Paris agreement, unless accompanied by federal and state regulatory actions (see chart 4).

One environmental advocate reckons that enforcing rules rigorously under the existing Clean Air Act would be “the most important thing the administration can do on climate”. Another thinks the absence of federal mandates in the IRA means that “we need the sticks at the state and local level”, such as low-carbon fuel standards.

America’s potential as a clean-energy superpower may yet be realised. To get there, though, the mighty obstacles to implementation must now be overcome. ■

Free speech at law schools

Legally bland

NEW YORK

A botched event at Stanford rekindles a debate over freedom of expression

“DO YOU SODOMISE your wife?” When a law student posed this query to Antonin Scalia during a Q&A at New York University in 2005, the audience was shocked. But the event resumed and the impertinent question to the Supreme Court justice was not quite a non sequitur: two years earlier the arch-conservative had written a strident dissent defending the constitutionality of laws banning sodomy.

On America’s other shore 18 years on, another right-wing judge speaking at a law school encountered a different kind of outrageous question. “Why can’t you find the clit?” a Stanford law student inexplicably asked Kyle Duncan, a judge on the Fifth Circuit Court of Appeals, on March 9th. Judge Duncan, a Trump appointee, faced a chorus of jeers as he tried to deliver his prepared remarks. He gave up after ten minutes of shouts including “we hope your daughters get raped” and “we hate you”.

Why the vitriol? Mr Duncan has issued rulings permitting abortion restrictions and stricter voting rules, and he once acerbically refused to use a transgender defendant’s pronouns. In contrast to Justice Scalia, who gave his interlocutor a stare and carried on, Judge Duncan struck back. “The inmates have gotten control of the asylum,” he told the students. He then penned an op-ed in the *Wall Street Journal* recounting his experience at Stanford.

Tirien Steinbach, the law school’s dean for diversity, equity and inclusion, who rose when Mr Duncan called for an administrator to restore order, compounded the tumult. She told the judge he was "absolutely welcome in this space", before saying his rulings had "harmed" students and she understood "why people feel like the harm is so great" that the law school should "reconsider" its free-speech rules.

The law school's dean, Jenny Martinez, and Stanford's president, Marc Tessier-Lavigne, wrote a letter of apology to Mr Duncan. Ms Martinez followed up on March 22nd with a ten-page letter to all at the law school clarifying its commitment to free expression and noting that Ms Steinbach was now on leave. Shutting down speakers "is incompatible with the training that must be delivered in a law school". To do so creates an "echo chamber that ill prepares students" to be "effective advocates".

Fallout from the event extended beyond the Bay Area. On March 29th four witnesses discussed the threat to "diversity of thought" on campuses at a congressional hearing. Each speaker—including one invited by Democrats, Suzanne Nossel, the head of PEN America, a free-expression organisation—agreed that meaningful campus exchanges between ideological rivals should be encouraged, not quashed.

But Ms Nossel was alone in opposing federal legislation to police campus expression, and to caution against state efforts to meddle in university curriculums. States including Florida, Mississippi and Iowa, she noted, had passed laws presenting an "unprecedented threat to open discourse". By declaring certain concepts off limits, she wrote, these laws "use state power to exert ideological control over public educational institutions".

In response to the students' behaviour, Ms Martinez promised a half-day training on freedom of speech as well as a more detailed policy for disciplinary sanctions. That is inadequate, believe two conservative circuit-court judges who pledged last year not to hire law clerks from Yale, where similar disruptions have occurred. On April 1st they extended the blanket boycott to Stanford graduates. Other conservative commentators have argued that the student hecklers should face punishment, not a seminar.

This hardline approach could backfire, Ms Nossel warns. If today's progressive students "come to see the cause of free expression as a punitive agenda or a smokescreen for hatred", she argues, they might come to displace free expression as a "bedrock American principle".

Nadine Strossen, a former president of the American Civil Liberties Union, agrees that "overly harsh punitive responses" are no solution. Yet even with "the best free-speech law and policies in the world", she says, little will change "unless there is also a free-speech culture". A recent survey found that nearly two-thirds of college students are fine with shouting down disagreeable speakers and nearly a quarter believe that violence may be used towards this goal.

At Yale last year some 120 students shouted down Kristen Waggoner, a lawyer who has argued for the right of Christian business-owners to refuse to provide services for gay weddings. Ms Waggoner's reprise visit to Yale in January was a success, according to Ms Strossen, who spoke at the event. Yet the strictures that helped make it go smoothly bothered Ms Strossen. With members of the press and Yale undergraduates barred, and recordings strongly discouraged, the "pendulum swung very far the other way" towards overly tight controls. This made the intellectually robust discussion a "lost learning opportunity" for everyone outside the room. ■

Chicago and Wisconsin vote

Bringing down the house

CHICAGO

Two elections show the limits of tough-on-crime politics

If there was a soundtrack to Brandon Johnson's campaign to be mayor of Chicago, it was house music. At his events, a truck blaring it out followed him around. At his election-night party, a DJ warmed up supporters with Chicago classics such as "Percolator" by Green Velvet and "Your Love" by Frankie Knuckles. Middle-aged women in union hoodies bopped alongside young men in suits. The queue for drinks stretched across the room. But the most appropriate song played at the event was, oddly enough, by a British band—"You Sexy Thing", by Hot Chocolate, with its chorus "I believe in miracles". When Mr Johnson came onto the stage, he began his speech with one word: Hallelujah.

BRANDON
JOHNSON
FOR CHICAGO

Miracle man

Mr Johnson's victory, by around three percentage points, was one of two striking wins for left-wingers on the western shore of Lake Michigan on April 4th. The other was in Wisconsin, where Janet Protasiewicz, a left-leaning Milwaukee circuit-court judge, won a vacant seat on the state's Supreme Court by a margin of about ten points, defeating Daniel Kelly, a conservative former member of the body, and giving liberals a majority on the court in the state for the first time in 15 years.

The two races were distinct. Chicago is a deeply blue city in a blue state, and voters had a choice between two Democrats, albeit ones from opposite ends of the same party. Wisconsin, by contrast, is a true battleground state in which Republicans dominate the state legislature. Yet in both places the results are a huge boost to the progressive wing of the Democratic Party. They also constitute a challenge to the idea that tough-on-crime rhetoric is a reliable way to win elections.

Mr Johnson's victory is the more surprising of the two. Few Chicago politicos expected the former public-school teacher and union organiser even to make it to the second round (the first round of the election was on February 28th). In January Lori Lightfoot, Chicago's outgoing mayor, mocked the teachers' union, Mr Johnson's primary patron, for pouring money into his campaign, saying: "God bless. Brandon Johnson isn't going to be the mayor of this city." He had struggled to shake off past radicalism, such as a claim he made in 2020 that defunding the police was a "real political goal", which many assumed would sink his campaign.

In the event, however, Mr Johnson's tangible charisma and radicalism drew out a young, left-wing crowd, even as he consolidated the votes of the other progressives he beat in February. And although his leftism probably did cost him some votes, he was also lucky in his opponent, Paul Vallas, a former head of the Chicago public schools. Like Mr Johnson, Mr Vallas spent much of the campaign trying to get away from past comments—in particular, two he made more than a decade ago in which he suggested that he was more Republican than Democrat, and that he was "fundamentally" opposed to abortion. In a city that has not elected a Republican mayor since the 1920s, Mr Vallas was arguably the more controversial candidate.

In Wisconsin, the liberal Ms Protasiewicz also won in a race in which her opponent attempted to paint her as weak on crime. Mr Kelly spent much of the campaign pointing to rapists she had apparently not jailed. Yet his own extremism cost ▸▸

him more. Ms Protasiewicz campaigned on her "personal values" of supporting abortion rights, which are popular but are also currently non-existent in Wisconsin, thanks to a law from 1849 brought back into effect by the United States Supreme Court last year. Mr Kelly was associated with a far less popular cause: that of the attempt to overturn the results in Wisconsin of the last presidential election, by having fake electors cast votes for Donald Trump. Though Mr Kelly tried to argue that he was merely an impartial lawyer advising a client, rather than a fully-fledged participant in the plan, evidently few voters in Wisconsin bought it.

The question now is whether in governing—or judging—they can satisfy their voters. Mr Johnson has promised radical changes to end Chicago's "tale of two cities", including tax rises to pay for social spending. But he will take over a government struggling with a black hole in its pension funds and a hostile police department. Similarly, Ms Protasiewicz, as part of the new liberal majority on the Wisconsin Supreme Court, will face demands from the base that elected her to make controversial decisions on law, such as throwing out the state's abortion ban, or imposing new election maps that are more favourable to Democrats. Both could end up disappointing at least a few of the people who propelled them to victory. ■

Defending Guam

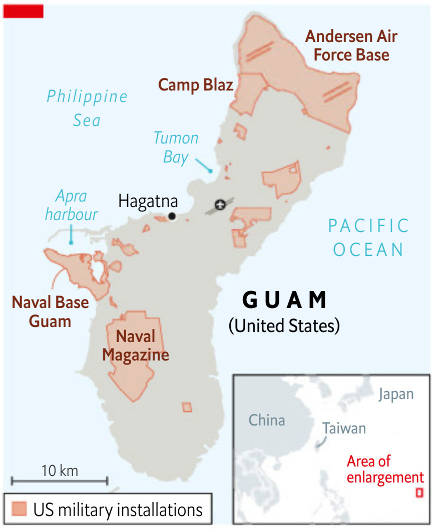
Where America's next war begins?

ANDERSEN AIR FORCE BASE

The tourist island and vital military outpost is surprisingly vulnerable

Like many of America's bases in the Pacific, Guam mixes hedonism with war jitters. Japanese and South Korean visitors revel on the sand of Tumon Bay, a coral-reef lagoon. Above, F-15 fighters and B-1 bombers bank to land at Andersen Air Force Base nearby. Below, nuclear attack submarines slip in and out of Apra Harbour. The marines are building a base up the road. Around lie reminders of the Pacific war between America and Japan. The last Japanese soldier surrendered in 1972.

"Where America's day begins", as Guam likes to sell itself (incorrectly), is also where a future American war with China may begin. This westernmost speck of America, just 30 miles (48km) long and with a population of about 170,000, helps it project power across the vast Pacific. As tension over Taiwan increases, war games often predict early and sustained Chinese missile strikes on Guam, and perhaps the use of nuclear weapons against it.



Startlingly, for such a vital military complex, Guam is only thinly defended. Its THAAD missile-defence battery is not always switched on. It is in any case intended to parry only a limited attack from North Korea, not an onslaught from China. Andersen has no Patriot ground-to-air missiles, though they are deployed at American bases in South Korea and Japan to defend against aircraft, cruise missiles and short-range ballistic missiles. Warships with Aegis air-defence systems offer extra protection, but they may not always be nearby. To judge from the ubiquitous metal traps on fences around Guam's bases, commanders seem more worried about the brown tree snake, an invasive species, than a surprise Chinese strike.

China makes no secret that Guam is in its crosshairs. The DF-26 missile, with a range of 4,000km, is commonly called the "Guam killer". In 2020 a Chinese propaganda video depicted an H-6K bomber attacking an undisclosed air base: the satellite image was unmistakably of Andersen. To survive within China's "weapons engagement zone", the American air force is developing "agile combat employment". This involves scattering aircraft to deny China an easy shot, and networking them with distant "sensors" and "shooters" to give battle. It practised such tactics in February at the Cope North exercise with Japan and Australia on Guam and nearby islands. At the end of each day, though, the jets were all parked together in neat rows in the open. The base has no hardened shelters for aircraft, and its fuel is stored in closely packed tanks above ground.

The vulnerability of Guam is belatedly getting attention in Washington, not least because successive heads of Indo-Pacific Command (INDOPACOM) in Hawaii, in charge of any future war with China, keep pleading for better protection. A plan is emerging. The Pentagon has requested $1.5bn to start beefing up the island's air defences in the 2024 fiscal year (which starts in October 2023). Much of this is for the Missile Defence Agency (MDA), which focuses mainly on missile threats against the American homeland, and the rest is for the army. INDOPACOM wants $147m more.

"We are playing catch-up," admits Vice-Admiral Jon Hill, director of the MDA. He says the first step will be to put the ship-based Aegis system on land. Unlike "Aegis ashore" systems in Poland and Romania, the version on Guam will have better radars, and many components will be "distributed": movable on wheels to improve their chances of surviving attack. Several radars will give all-round coverage. With THAAD, this will provide more robust protection against ballistic missiles.

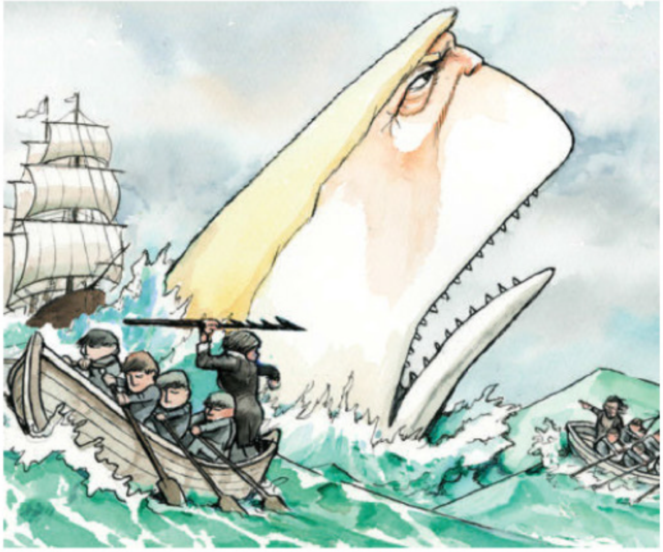
Cruise missiles may prove a bigger menace because of their greater numbers, and ability to fly low and turn. These would be taken on mainly by army systems: Patriot; its more powerful successor, LTAMDS; and a shorter-range system called IFPC. The first elements should be in place by 2024. Future kit will be integrated as it becomes available. It may eventually include weapons to take out hypersonic missiles, which are hard to hit because they fly fast and manoeuvre, and "directed energy" systems (using lasers and microwaves).

All this raises questions. One is the timetable: several of the components are not yet in production, and much of the money is still going on research and development. Another is whether disparate systems from the MDA, navy and army can be fully integrated so that commanders can fight off many kinds of missiles from many directions. A third is whether a polarised Congress will pass a budget on time. And last, many of Guam's people may well ask: will ever more military hardware on Guam endanger us, or scare away the tourists? ■

THAAD's not enough

Lexington | White wail

The charges in Manhattan have restored Donald Trump to his favourite role



“I bring out the worst in my enemies,” Roy Cohn, a ferocious red- and gay-baiting lawyer, once told William Safire, a conservative columnist, “and that’s how I get them to defeat themselves.” Donald Trump, for years Mr Cohn’s client and ardent pupil, has outdone his mentor: Mr Trump brings out the worst in everyone—enemy, ally and onlooker alike.

How else to explain the ecstasy of news-media speculation and vamping as Mr Trump’s arraignment approached on April 4th, the historic and unprecedented use of the words “historic” and “unprecedented”, the online tracker CNN created so that panting viewers could follow along as Mr Trump’s plane delivered him from Florida to New York City?

And how else to explain the indictment itself? Democrats and their sympathetic commentators had been predicting that when the charges were unsealed, they would prove far darker than the familiar accusations that Mr Trump orchestrated a scheme in 2016 to pay hush money to smother embarrassing revelations and enhance his chance at the presidency. They said the indictment would show that Alvin Bragg, the Manhattan district attorney, was not relying on an unusual gambit to bootstrap what are misdemeanours under state law—falsifying business records—into felonies by linking them to violations of campaign-finance law. They predicted that Mr Bragg would not be counting heavily on the testimony of Mr Trump’s former lawyer, Michael Cohen, whose integrity might not impress a jury since he has already pleaded guilty in the scheme and to lying to Congress.

Yet in the end the surprise was that the indictment held none. Of course, as Mr Bragg’s defenders say, no American should be above the law. No principle of good governance could immunise former presidents from being prosecuted for committing crimes. There is also rough justice in Mr Trump, who has so often called for opponents to be jailed, finding himself in the dock. But in choosing to charge this former president with these crimes, Mr Bragg has done less to vindicate the rule of law than to put it at risk. He has smoothed Mr Trump’s path back to the Republican nomination and thus to the White House.

Not long ago, Mr Trump seemed to be waning as a political force. Even some of his supporters worried that, as he whined about the 2020 election and his brace of impeachments, he came across as obsessively pursuing stale personal grievances rather than championing Americans’ concerns. Fox News had turned its cameras away from him and trained them on a seemingly formidable, likely challenger, Governor Ron DeSantis of Florida.

But this indictment is transforming Mr Trump from Ahab back into the great white whale. With all eyes once more upon him, he is again bearing down on America’s democracy. Mr Bragg has returned Mr Trump’s litany of grievance to the present tense and him to his favourite role, as the target of obsessed leftists. “They are not coming after me,” Mr Trump likes to tell his crowds. “They are coming after you, and I am just standing in their way.” After the indictment, he delivered a particularly vicious speech at his Florida club. “The only crime that I have committed”, he said, “is to fearlessly defend our nation from those who seek to destroy it.”

Mr Trump has denied the charges and any affairs, but he has admitted paying hush money to protect his reputation, without regard for any campaign. Past sex scandals involving President Bill Clinton and Senator John Edwards suggest voters and juries have a high tolerance for political chicanery to conceal intimate matters.

Maybe Mr Bragg will persuade a jury in the end. But with Mr Trump not due back in court in this case until December, even Republicans who are determined to stop him are accusing the prosecutor, a Democrat, of playing politics. Senator Mitt Romney of Utah said Mr Bragg had set “a dangerous precedent for criminalising political opponents”. Mr Trump has surged in recent polls, and he claims to have hauled in millions of dollars in donations with his pleas for support against the prosecution in Manhattan.

In the clearest index of broader Republican sentiment, Mr Trump’s opponents for the nomination have felt it necessary to fall in behind him. (One noble exception is Asa Hutchinson, a former governor of Arkansas, who said Mr Trump should withdraw out of respect for the justice system and the presidency.) In mid-March Mr DeSantis mocked Mr Trump for “paying hush money to a porn star”. But he soon joined the chorus, pandering with an empty vow not to “assist in an extradition request”.

Dopes and prayers

The White House apparently regards this as good news. Joe Biden, who is all but certain to run for re-election, is said to believe Mr Trump is the easiest Republican to beat. Other, more threatening indictments are probably headed Mr Trump’s way, over his attempts to overturn the election and to make off with classified documents. The publication *Politico* reported on April 4th that Mr Biden’s advisers believe the swing voters who deserted Mr Trump in 2020 will not return to him, given all the furore he creates.

What dangerous assumptions. Mr Trump may have lost the 2020 election by 7m votes, but he was just over 40,000 votes away from tying Mr Biden in the electoral college. In a general-election campaign, Mr Trump can count on polarisation to rally doubting Republicans behind him, and Mr Biden’s approval ratings remain low by historic standards. Who knows what may happen with his health or the economy. The indictment in New York may help Mr Trump demean any other legal action against him.

It could be hoped, once, that the challenge to decency posed by Mr Trump would bring out the best in America. Instead, Mr Trump has made zealots and quislings out of Republicans while inflaming and dumbing down Democrats and polarising, which is to say corrupting, the news media. He promises to make America great but he keeps making it worse, and he is far from done. ■

Middle East & Africa

New thinking on population growth

Africa’s slowing baby boom

DAKAR AND KANO

Fresh evidence suggests that Africa’s birth rates are falling fast, with huge implications for the world’s peak population

“I HAVE TEN children,” says Rahama Sa’ad squatting outside her shack on the outskirts of Kano, the biggest city in northern Nigeria. “It’s the will of God,” she explains, as chickens, children and grandchildren scramble around her. In northern Nigeria big families are easy to find. Abdulkadar Dutse, a local businessman in Kano, is one of 35 siblings split among the four wives of his father.

Such stories of big families inform much of how the world thinks about sub-Saharan Africa, not just now but over coming decades. At conferences and in cabinet meetings across the continent, politicians and policymakers fret about how to educate, employ, house and feed a population that the UN expects to grow at breakneck speed from around 1.2bn people now, to 3.4bn people by 2100. In southern Europe, populists stoke up fears that hundreds of millions of Africans may try to cross the Mediterranean to escape poverty, war or hunger. Across the rich world, environmentalists fear the impact on the climate and planet of an extra 2bn people.

Yet few have noticed a wealth of new data that suggest that Africa’s birth rate is falling far more quickly than expected. Though plenty of growth is still baked in, this could have a huge impact on Africa’s total population by 2100. It could also provide a big boost to the continent’s economic development. “We have been underestimating what is happening in terms of fertility change in Africa,” says Jose Rimon II of Johns Hopkins University. “Africa will probably undergo the same kind of rapid changes as east Asia did.”

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The UN’s population projections are widely seen as the most authoritative. Its latest report, published last year, contained considerably lower estimates for sub-Saharan Africa than those of a decade ago. For Nigeria, which has Africa’s biggest population numbering about 213m people, the UN has reduced its forecast for 2060 by more than 100m people (down to around 429m). By 2100 it expects the country to have about 550m people, more than 350m fewer than it reckoned a decade ago.

Yet even the UN’s latest projections may not be keeping pace with the rapid decline in fertility rates (the average number of children that women are expected to have) that some striking recent studies show. Most remarkable is Nigeria, where a UN-backed survey in 2021 found the fertility rate had fallen to 4.6 from 5.8 just five years earlier. This figure seems to be broadly confirmed by another survey, this time backed by USAID, America’s aid agency, which found a fertility rate of 4.8 in 2021, down from 6.1 in 2010. “Something is happening,” muses Argentina Matavel of the UN Population Fund.

If these findings are correct they would suggest that birth rates are falling at a similar pace to those in some parts of Asia, when that region saw its own population growth rates slow sharply in a process often known as a demographic transition.

A similar trend seems to be emerging in parts of the Sahel, which still has some of Africa's highest fertility rates, and coastal west Africa. In Mali, for instance, the fertility rate fell from 6.3 to a still high 5.7 in six years. Senegal's, at 3.9 in 2021, equates to one fewer baby per woman than little over a decade ago. So too in the Gambia, where the rate plunged from 5.6 in 2013 to 4.4 in 2020, and Ghana, where it fell from 4.2 to 3.8 in just three years.

These declines bring west Africa closer to the lower fertility rates seen in much of southern Africa. Dropping rates have already been celebrated in places such as Ethiopia and Kenya (see chart on next page).

Demographers are divided over how much to read into these recent surveys, particularly since the data they produce can be noisy. "When you see a precipitous decline in fertility, your starting-point is that something is wrong with the data," says Tom Moultrie of the University of Cape Town. Some point out that survey responses in Africa on desired family size have fallen little, though not all recent surveys ask that question. Other demographers reckon the data point to real changes. Still, many caution against comparing rates across different sorts of polls. Yet even comparing only within iterations of the same survey (as *The Economist* has done with the figures above), the trend is evident. Comparing across them in the case of Niger, which has the world's highest fertility rate but few surveys, shows a decline from 7.6 in 2012 to 6.2 in 2021.

Others are also reducing their projections. In 1972 the Club of Rome, a think-tank, published an influential book, "The Limits to Growth", warning that consumption and population growth would lead to economic collapse. Now it says the population bomb may never go off: it reckons sub-Saharan Africa's population may peak as soon as 2060, which is 40 years earlier than the UN's projections.

Even so, fertility rates are not dipping uniformly. Some countries, including Angola, Cameroon and Congo, are seemingly stuck at relatively high rates. And there are often big regional differences within countries such as Kenya (see next article). Almost everywhere in Africa, fertility rates are much lower for urban women, who typically have 30-40% fewer children than those in the countryside.

Demographers would be more inclined to agree that these fertility declines are real and likely to continue if they could easily identify their causes. In Ethiopia, Kenya and Malawi, past plunges have been strongly associated with higher use of contraception, often thanks to big government pushes. In Malawi and Kenya well over half of married women use modern contraception such as the pill or injectables, while in Ethiopia about 40% do. The use of such methods is markedly lower in west Africa (see map on next page), but improvements from a low base are probably part of the reason for the fertility drops. In Nigeria contraception use has gone from 11% to 18% in the past five years. In Senegal it has doubled to 26% in the past decade.

Family planning, especially when promoted by outsiders, has often caught the ire of religious leaders. Yet in some places that may be changing. Clerics talk more often about family planning these days, notes Amina Mohammed, a devout mother on the outskirts of Kano. "There is no verse in the Holy Koran where Muslims are forbidden from controlling, planning or restricting the number of children they have," says Shuaib Mukhtar Shuaib, one such cleric. The Prophet Muhammad tacitly approved of the withdrawal method, he continues. These days Idris Sulaiman Abubakar, a gynaecologist in Kano's biggest public hospital, is more worried about the impact of Nigeria's film industry on contraception than that of religion. "They'll bring a story-line that the woman's reproductive system was damaged because she uses pills," he explains.

Girls' education also makes a big differ-

African demography

Northern Kenya's exploding population

NAIROBI

Urbanites plan their families a lot more carefully than the rural poor

EASTLEIGH, A NEIGHBOURHOOD of Nairobi, Kenya's capital, is a thrumming hive of hawkers, honking cars, belching lorries, potholed pavements, jostling pedestrians and legions of young men loafing around, clearly out of work. "Too many cars, too many people," tut-tuts Charles Mwangi, a taxi driver from another part of the sprawling city, which overall has grown in population from 361,000 at independence in 1963 to some 5.3m today.

Eastleigh is the urban hub of ethnic Somalis, who make up nearly 6% of Kenya's population and are among its fastest expanding groups. At last count, women in the mainly Somali counties of the arid north-east, many of whom drift into the city, still on average bear more than seven children each. This rate is common elsewhere across northern Kenya, where drought, conflict and poverty dangerously persist. It is also high in some parts of the west, near Lake Victoria, where polygamy among some groups is still common.

Where the antelope once roamed

Kenya's population has grown at breakneck speed. At the end of the 19th century, when British colonisers first imposed themselves, the populace may have been as small as a million or so. Kenya's first formal estimate, in 1921, put it at under 3m. At independence in 1963 it had hit 9m, and it is now close to 55m. At this rate the population could hit 85m by 2050, according to the UN, which would be "completely unsustainable", laments a conservationist who promotes the co-existence of wildlife and people, particularly dirt-poor pastoralists.

Yet Kenya's fertility rate has been dropping sharply, from 6.7 children per woman in 1989 to 3.4 last year, according to a recent demographic and health survey. It also shows a marked difference between town and countryside. On average, urban women are expected to have 2.8 babies each, which is one fewer than the 3.9 of their rural cousins. Among the burgeoning middle class, two children is becoming the norm.

The survey hints at how this is being achieved and at the challenges that remain. Overall 57% of married women use modern contraceptives, with even higher proportions in counties surrounding Nairobi. Yet Mandera county, up against the Somali border, has a fertility rate of eight. Just 2% of married women there use birth control, which is frowned upon by many Kenyan Muslims and evangelical Christians.

A former president, Mwai Kibaki, who stepped down in 2013, regularly spoke out in favour of family planning. But William Ruto, elected to the post last year, has so far been notably silent on it.

ence to fertility rates. In Angola, for instance, women without any schooling have 7.8 children, whereas those with tertiary education have 2.3. Educated women have a better chance of a job, so the opportunity cost of staying at home to look after children is higher and they are more likely to win arguments with their husbands over how many kids to have.

Research by Endale Kebede, Anne Goujon and Wolfgang Lutz of the Wittgenstein Centre for Demography and Global Human Capital suggests that a stall in Africa's demographic transition in the 2000s may have stemmed from the delayed effect of cuts in spending on education in the 1980s, when many African economies were in crisis. The rapid falls in fertility rates that now seem to be taking place could be because of the huge push to improve girls' schooling in the past few decades.

Economists tend to think that poor families have more children to ensure that some survive to look after their parents in old age. But that logic may be changing, too. Zainab Abubakar, a 30-year-old mother wrapped in a blue hijab in the outskirts of Kano, has two kids but does not want any more. "The cost of living is high," says Ms Abubakar, who sells charcoal.

She is not alone. When the economy in Nigeria soured between 2013 and 2018, the number of women wanting no more kids jumped from 19% to 25%. As the costs of raising children rise, more parents worry about being able to educate them. "We are trying to make our children productive," explains Ms Abubakar, when asked why she does not want more of them. Even rural Nigerians are thinking about the trade-off between having many poorly-educated kids or fewer ones with better job prospects, says Funmilola Olaolorun of the University of Ibadan.

The end of baby-kissing politics

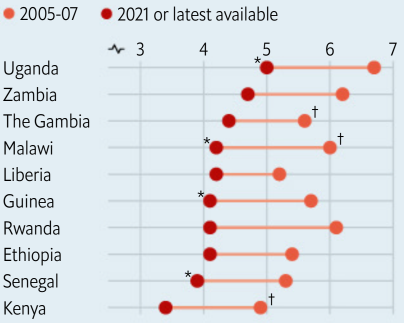
Leaders may also play a role. In Uganda, President Yoweri Museveni used to tell students: "Your job is to produce children." Now he tells Ugandan women that lots of pregnancies will "weaken your bodies and many children are not easy to manage and nurture." President Mohamed Bazoum of Niger made the "fight on demography" the core of his election campaign. In Nigeria, funding for family planning is low but President Muhammadu Buhari recently created a National Council on Population Management, underscoring "the urgency to address Nigeria's sustained high fertility rate, through expanding access to modern family planning".

In the past many African politicians were suspicious that Western eagerness to promote family planning was a ruse to keep African countries from growing populous and strong. Such attitudes are rarer these days. Alas, another form of muddle-headed thinking has taken root among Western environmentalists, who link Africa's population growth to climate change.

Peak baby

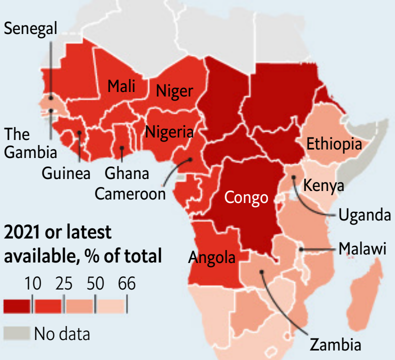
Sub-Saharan Africa

Fertility rate, selected countries



Married women using modern contraception

Aged 15-49



*Malaria Indicator Survey data

†Gambia 2013, Malawi 2004, Kenya 2003

Source: DHS programme

Yet wealthy Westerners cause many times more greenhouse-gas emissions than Africans do. That "we should have fewer Africans so we can drive polluting cars seems to me a really odd ethical position to take," points out David Canning of Harvard University. Worries about African migration to Europe also seem peculiar, since the EU and Britain are expected to be short of about 44m workers by 2050, even with normal migration flows.

Misguided Western worries aside, the implications of continued or accelerated declines in fertility rates are enormous. For a start, Africa's population—and therefore the world's—would be considerably lower than most current projections. Take Nigeria. If the latest surveys are correct in finding that its fertility rate was 4.6 in 2021, this would suggest that it was already at a lower bound of the UN's estimates and on a much lower fertility trajectory than the UN's main forecast. Assuming Nigeria stays on the lower trajectory, then its population would get to about 342m people in 2060. That is some 90m people fewer than the UN's current base estimate and some 200m fewer than it forecast ten years ago.

This is good news, though not, as some would have it, because Africa is overcrowded. In fact sub-Saharan Africa has an average of 48 people per square kilometre, which is far lower than Britain (277), Japan (346) or South Korea (531). Of sub-Saharan Africa's five most populous countries, all are below Britain's density. There is little evidence of whole African countries being stuck in a Malthusian trap, named after Thomas Malthus, who claimed population growth would outstrip food supply, leading to catastrophe. Trade and global food production, which is rising while the amount of land used for it is falling, means that neither sub-regions nor even countries need be self-sufficient provided their economies produce the wealth to buy it.

Nor is it because high population growth necessarily means economic growth per head is low. "It's not very clear that we have the data to be able to say for sure that the population growth rate itself is bad or good," says Anne Bakilana of the World Bank. Richer places have fewer children and higher savings rates. But teasing out the causality is tricky.

What is clearer is that the transition from high population growth to a lower one can bring a bevy of benefits. Women and children are both more likely to prosper as fertility rates fall. Fertility drops usually mean wider gaps between births and fewer teenage pregnancies: both help reduce risks to a mother's health. And falling fertility rates mean there are more working-age adults relative to the number of children. With fewer mouths to feed at home, each child is more likely to get enough food, as well as books and uniforms for school. At the national level smaller cohorts could allow governments to spend more per child.

Falling fertility rates also excite economists because they boost both the working-age share of the population and the number of women in the workforce. More people working should boost prosperity. The faster fertility rates fall, the bigger the impact. A study in 2017 by Mahesh Karra and David Canning of Harvard University and Joshua Wilde of the University of South Florida estimates that lowering the fertility rate by one child per woman in Nigeria could almost double income per person by 2060. Yet for countries to reap a big dividend, those entering the job market need to be able to find productive jobs—a monumental challenge in a continent that must invest trillions of dollars in the infrastructure (such as roads, power lines and ports) needed to generate them.

Fertility numbers seem dull when set against the drama of elections, conflict and economic helter-skelter. Yet in survey after survey Africa's biggest story of the future may be quietly unfolding. ■

Real estate in the Gulf

Up and out

DUBAI

A red-hot property market is making Dubai residents see red

Too much good news can be a bad thing. Dubai, the commercial capital of the United Arab Emirates (UAE), has had lots of the former in the past two years. Lax restrictions during the pandemic lured expats. Russia's invasion of Ukraine brought another influx of new residents.

High oil prices have added to the boom-time feeling. Restaurants and bars are heaving. Rush-hour traffic is back to pre-pandemic levels. Public transport moved a record number of passengers in February.

For some residents, though, the good news is grating. Annual inflation hit a 14-year high of 7.1% last summer, partly due to soaring petrol prices (unlike other Gulf states, the UAE does not subsidise fuel). It has since dropped to less than 5%, below many other rich economies. But the headline number does not tell the full story.

Official inflation figures for 2022 showed just a 0.6% increase for housing and utilities, which make up 41% of the consumer-price index. These track all leases, however, so do not reflect recent rises in rents; many in Dubai are feeling steeper increases. Apartment rents rose by 28% in the year to February, to almost 100,000 dirhams (about $27,200), estimates CBRE, a property firm.

Three factors explain the surge. One is demand, from Russians and other new arrivals. Many seek to live in Dubai's most fashionable areas. On Palm Jumeirah, an artificial island in the Gulf, a two-bedroom flat that rented for 100,000 dirhams two years ago can now fetch 215,000 dirhams.

Next is a booming property-sale market. At around 1,200 dirhams a square foot, apartment prices are at their highest in almost a decade. Some investors who bought homes early in the pandemic flipped them, two years later, for profits of 50% or more. Rising prices have made some landlords unscrupulous, asking for rental increases beyond the 20% per year allowed by law.

Dubai's property market has much to recommend it, from low taxes to a vast pool of would-be renters. But some wonder if the sector, the backbone of Dubai's economy, is again becoming a bubble. The city has already endured two real-estate crashes this century: an abrupt one during the financial crisis in 2008, when property values fell by half, and a slower one from 2014 to 2020, when they slid by 35%.

Buyers are still piling in, but some rental rates may be peaking. In popular areas like the Palm and downtown Dubai, they were either flat or declined in February, according to CBRE. Instead they grew in less desirable inland areas—suggesting that renters are voting with their feet.

Other prices are climbing. Annual food and drink inflation was above 6% in February. The UAE imposed price caps in 2022 on a few staples. Petrol prices, though reasonable by global standards, hit a record last summer. Authorities shut down a local newspaper after it covered the issue. School fees are a burden for expats.

Despite its reputation as a modern-day El Dorado, salaries in Dubai are not keeping pace with rising prices. Cooper Fitch, a consultancy, estimates that they will increase this year by only around 2%.

Some of this galloping inflation should be temporary. Rental prices may drop as landlords temper expectations and new homes enter the market.

Some economists argue that the UAE should try to ease the tax burden on residents and firms. It introduced a 5% value-added tax in 2018, and in June it will start to collect a 9% corporate levy. Even as it introduces formal taxes, it has kept many of the fees that amount to stealth taxes, like a steep housing surcharge added to electricity bills in Dubai. In January the emirate did suspend its 30% tax on alcohol—comfort, perhaps, for residents who want to forget their new rental contracts. ■

Water in the Middle East

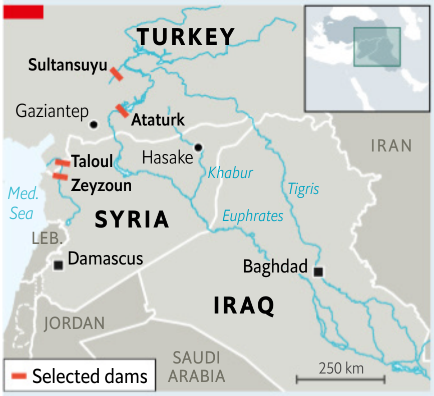
Dam-nation

The recent earthquakes have left Middle Easterners worried about their dams

The Turkish authorities announced on March 30th that 140 dams had been inspected since two earthquakes hit southern Turkey and northern Syria in February. None, they insisted, was seriously damaged. Still, many in the Middle East remain fearful about the state of the more than 860 dams along the Euphrates and Tigris rivers and their tributaries.

UN officials say that, since the earthquakes, fractures have appeared in eight dams in the region including three in Syria. The Taloul dam in the Syrian province of Idlib, already devastated by war, was struck by an aftershock and burst on February 8th. The flood washed away this year's harvest and filled the streets with debris. Thousands fled. Cracks over a metre wide have been seen in the Sultansuyu dam 200km north of the Syrian border, prompting the Turkish authorities to discharge its waters as a "precautionary measure". Engineers, however, say the dam is damaged beyond repair.

Taloul is one of the Middle East's smaller and shoddier dams and is made of compacted earth. No concrete dam has ever failed as a result of earthquakes, points out Jonathan Hinks, a former chairman of the British Dam Society and an editor of a book on earthquakes and dams to be published this year. Fears that Turkey's vast Ataturk Dam, the world's third-largest, had been damaged in the recent quakes proved unfounded.



Others are less confident. Many dams in the region are made at least partly of earth. In such barriers even small leaks can lead to a build-up of pressure that can wash them away, says Ceyhun Ozcelik, a professor of engineering from Gaziantep, a city near the recent earthquakes' epicentre. Two decades ago, the Zeyzoun dam in northern Syria crumbled in hours, inundating nearby villages. The region's high dams (those at high altitudes with high walls) are hundreds of times larger. And years of war mean many in Syria and Iraq are in disrepair.

The dams themselves can induce seismic activity when the water pressure builds near tectonic faults. About 140 quakes seem to have been caused in this way globally since the 1960s, in at least one case killing thousands.

After February's earthquakes and then heavy rains, Turkish officials eased the pressure on dams by lowering water tables. Rivers that had dried up because of the dams turned to torrents. In the city of Hasake in north-eastern Syria the Khabur river ran through parched farmlands for the first time in years. Islands that had surfaced in the Tigris in Baghdad, Iraq's capital, briefly sank again. It is a sign of the region's sclerotic management of its waterways that it takes earthquakes to get them flowing.

TQ

The Economist
Technology Quarterly:
Electric grids

→ **April 8th 2023**

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The ultimate supply chains

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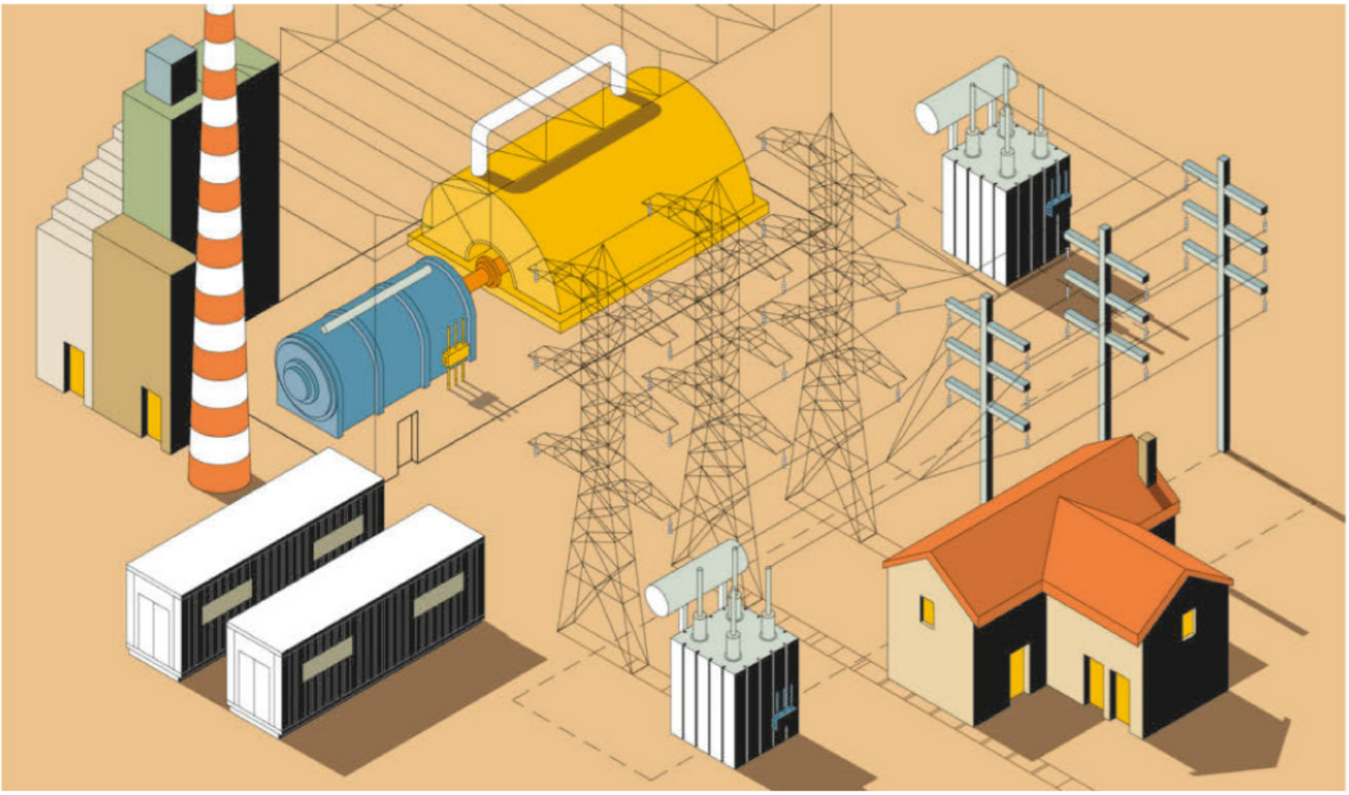


Electrical grids

The ultimate supply chains

One of the foundations of modernity is about to be transformed, reports Hal Hodson

IN THE TURBINE hall at Drax, a power plant in the English county of Yorkshire, sit six monsters of angular momentum. They are massive—2,800 tonnes each—and complex, composed of 28 turbine sub-assemblies. And they spin on their axes 3,000 times per minute. Place your hand on the blue metal casing around one of them and your whole body thrums in harmony. The hall's floor hums a flattened A three octaves below middle C that numbs the soles of your feet.

The turbines are driven by high-pressure steam produced in vast boilers that hang from the ceiling. The boilers' walls are meticulously insulated, but you can still feel the heat of their 1,100°C (2,000°F) bellies at 20 paces. For most of Drax's life those flames have been fed by a steady stream of coal, tens of thousands of tonnes of it pulverised and blasted into the blaze every day.

Today, in a sign of the times, most of Drax's boilers burn biomass instead. The shift is part of the move towards renewables taking place around the world. Removing fossil fuels from electricity generation is universally seen as a necessary, but not sufficient, step towards stabilising the level of greenhouse gases in the atmosphere. The attractions are clear: much of the world already runs on electricity; there are many sources of non-fossil-fuel energy available, some very cheap; and increasing electricity's share of total energy use by encouraging use of electric vehicles, heat pumps and the like looks comparatively easy.

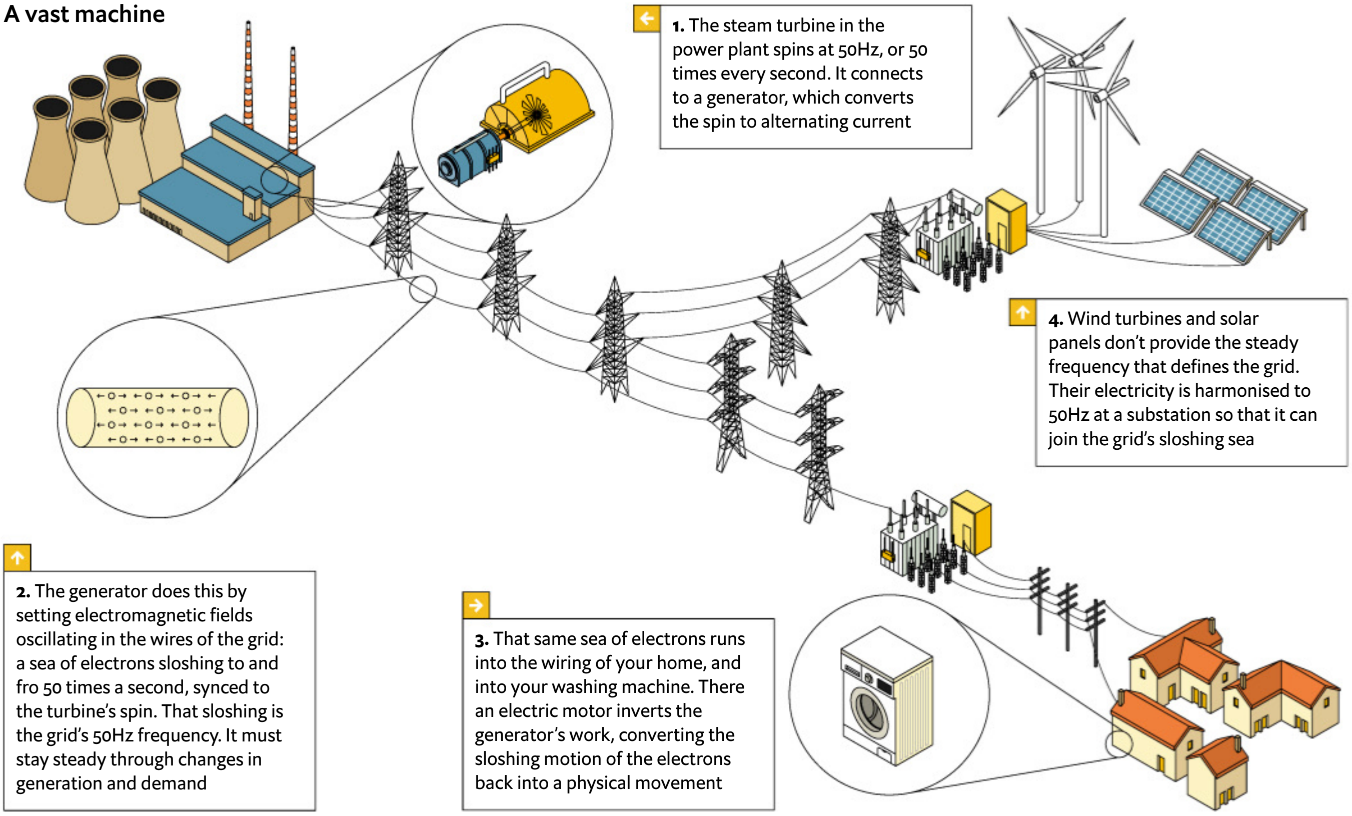
To abandon mines and oilfields in favour of energy from sunshine and thin air is not merely good climate policy. It has the appealing feeling, as electrification always has, of progress through dematerialisation. The thrilling, visceral sense of immensities in harness provided by the sights, sounds and vibrations of a turbine hall will become increasingly archaic. But if the production of electricity through motionless glass panels and blades turned by the wind seems effortless and futuristic, getting the gigawatts to the consumer will remain a very physical process.

Within Drax, energy flows from fuel to flame to steam to spin; but to serve the world beyond the walls a last transformation is needed. The turbines' driveshafts spin powerful magnets which are encircled by the copper wires of an electric generator. As the spinning magnets' poles point first this way then that, their magnetic field pushes and pulls at the electrons in the generator's wires, setting them aquiver with energy. This electromagnetic coupling bleeds off the turbine's kinetic energy at exactly the same rate as the high-pressure steam replenishes it, thus making that energy available to anything connected to the generator in an electric circuit.

For Drax, that circuit is Britain's national grid. The 50 cycles a second (50HZ) alternating current (AC) power available from pretty much every socket in the country is a national expression of the vibrating floors in Drax and other powerhouses. Its pulsations unite the spinning generators which feed it and all the devices plugged into it into a single vast machine.

In the early days of mains electricity, customers were supplied with power by a generator devoted to their factory or from a single ▸▸

A vast machine



1. The steam turbine in the power plant spins at 50Hz, or 50 times every second. It connects to a generator, which converts the spin to alternating current

2. The generator does this by setting electromagnetic fields oscillating in the wires of the grid: a sea of electrons sloshing to and fro 50 times a second, synced to the turbine's spin. That sloshing is the grid's 50Hz frequency. It must stay steady through changes in generation and demand

3. That same sea of electrons runs into the wiring of your home, and into your washing machine. There an electric motor inverts the generator's work, converting the sloshing motion of the electrons back into a physical movement

4. Wind turbines and solar panels don't provide the steady frequency that defines the grid. Their electricity is harmonised to 50Hz at a substation so that it can join the grid's sloshing sea

nearby power station. But the advantages of pooling resources soon became apparent. Generator frequencies were synchronised to 50Hz (60Hz in the United States and a few other places) so that high-voltage lines could combine currents from different generators. As high voltages are not good for consumers, transformers—a technology which only works in AC systems—were developed to step those high voltages down to lower domestic ones. The familiar architecture of pylons and substations housing transformers began to appear.

That physical infrastructure made electricity supply look solid and static, part of the industrial furniture. That appearance can and does deceive. The grid is oddly immaterial and highly dynamic. Its conditions are endlessly subject to change because of a fundamental truth about electrical-power systems: supply has to match demand in real time.

At any given time the amount of power being drawn out of the grid to do work—the load—has to be matched by what is going in. The amount of power being used by washing machines, lights, smart speakers, air conditioners, heart monitors, fan-assisted ovens and all the other components of modern life has to be the same as the amount being generated. This means that, as the electromagnetic drive train of a machine in which movement at one end—a spinning turbine—and movement at the other—a dishwasher, say—the grid is in constant flux. And so it needs constant supervision lest some sort of imbalance causes it to crash.

This machine kills carbon

This complexity made increasing the size of grids a challenging task. But the benefits were seen as worth it. Patterns of use among a million users are statistically reliable in the way that the patterns within a single household are not. More predictable demand can be met by bigger, more efficient generators. Bigger grids allow bigger loads. It was the grids which allowed the smelting of aluminium, and thus the building of planes, on a new scale that made America the second world war's "arsenal of democracy". They allow economies of scale and geography in generation, too. By the 1960s it made sense to build behemoths like Drax next to Yorkshire's coal field and distribute their power around the country.

Now things have to change. At present, 62% of the energy delivered as electricity comes from fossil fuels; that has to come down to more or less zero. A lot of its replacement will be in the form of cheap wind and solar, and that presents a serious challenge to grid operators. It means a lot of new connections, which are troublesome. The problem is exacerbated by the fact that renewable installations typically generate less power than steam turbines do. That means more connections per unit of capacity.

As well as adding a great many new connections, grids will also have to change shape. The places best suited to the generation of renewable energy in very large amounts are often not the places where today's generation is concentrated. So new transmission lines will be needed. And because grids are complicated things, some of those expansions will require compensating changes elsewhere as bits of the grid become congested.

Renewables are also intermittent. An obvious way to lessen this problem is to expand grids so that they can access renewable resources over larger areas. Even if this is done, though, grids in which renewables play a large role will require connections to a lot of new energy storage. Some will be located alongside the renewables; some will not, complicating things further. To ease the storage challenge grids will also need access to demand-management systems through which they can reduce demand on various different time scales.

Last of all, various ways in which grids are controlled and balanced today are physically rooted in the way steam turbines generate power. They will need to be rethought. In the long run this is a welcome opportunity to make the system cheaper and more reliable. In the short term it is a requirement for yet more investment.

And in the midst of all this change, grids will also have to grow ▸▸

in capacity at a rate the developed world has not seen for many decades. As a lot of the things fossil fuels are used for—such as powering vehicles or heating houses—become electrified, demand will shoot up (see chart). Electricity makes up just 20% of the world's energy consumption today, but in the future it "will be the backbone of the entire energy system", says Gerhard Salge, chief technology officer of Hitachi Energy, one of the key suppliers of grid equipment. His firm estimates that by 2050 the world will need four times as much electricity generation as it has today, and three times as much transmission capacity.

The technologies to meet these challenges are for the most part already available, as this report will explain. A revolution in the application of solid-state electronics to power systems, combined with improved technology for building high-voltage direct-current circuits, is easing the connection of far-flung renewables to grids, helping to reduce congestion and making interconnections between grids easier to set up. These technologies should also provide ways of keeping grids stable as many of the huge turbines they have relied on as their pacemakers are retired.

But fielding them requires a huge amount of investment. A recent study by the Energy Transitions Commission, a coalition of companies and financial institutions, found that $1.1trn must be spent on the grid every year until 2050 if the world is to reach its net-zero goal. That is on top of the cost of new generating capacity.

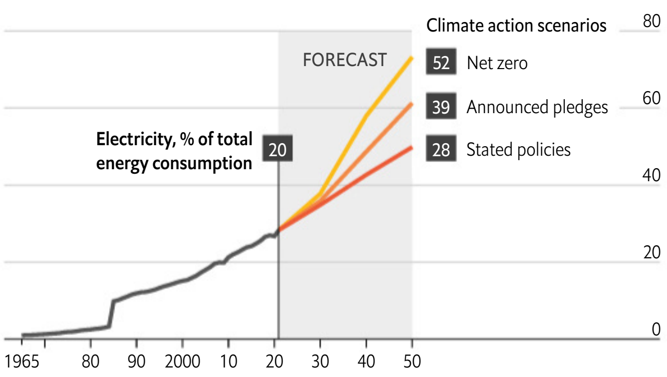
It also requires a level of executive determination unprecedented outside times of all-out war. Steve Brick of the Clean Air Task Force, an American NGO, used to work in grid regulation. When he looks at maps showing the expansion of American transmission infrastructure which a decarbonised system is said to require, he says, "I put on my practical hat…and I say that's not gonna happen." Local opposition to new infrastructure may be the largest obstacle. It will not be the only one. If he is right, and the grid cannot expand at the rate needed to decarbonise the economy, there will either be a massive move towards decentralised systems, a failure to reduce emissions fast enough, or both.

A degree of decentralisation in some markets is inevitable and will often be welcome. Roughly 1bn people, a large majority of them in Africa, currently lack any access to electricity. Local renewables can bring them some of its advantages more quickly than grid connections will. But there is good reason to think that modern grids moving copious energy over long distances will bring more energy to more of those who need it.

If, that is, energy can be delivered to the grid in the first place. Connecting new resources to the grid is a tricky technical matter; it is also a procedure that is vulnerable to delays stemming from regulation, speculation, politics and protest. This is the problem we turn to first. ■

More immateriality, please

Global electricity generation*, TWh, '000



Sources: Our World in Data; IEA

*Data before 1985 does not include coal

Connection queues

Hurry up and wait

In developed countries it has never been harder to add capacity to the grid

CHILL SUN SOLAR, a facility in Nevada with a generating capacity of 2.25GW, should produce enough electricity to meet 1.7% of California's annual demand. The 4.1GW Berwick Bank wind farm, off the east coast of Scotland, will provide more energy over a year than could Britain's two largest gas-fired power stations running full tilt. But none of this will matter until these renewable heavyweights get hooked up to their respective grids.

The grids used by developed countries are not accustomed to rapid change. At the turn of the century a couple of power plants a year might be connected to meet new demand driven by demographic change, to replace plants at the end of their lives or, as in shifts between coal and gas, to compete on price. But the overall rate was typically slow, with net capacity changing little and new plants often using the same connections as old ones.

Unsurprisingly, the business of supplying the highly specialised components big grids require was paced to match. Take the transformers needed to step electricity up to, and down from, the highest voltages on the grid—massive machines made with bespoke techniques. Gleaming fettuccine strands of copper bundled into sapling-thick, paper-sheathed cable are wound tightly around bus-sized wooden frames by patient hands. Such windings, perfect to the millimetre and precisely tailored to the buyer's requirements, are then brought together in huge structures of wood and glue—any metal would disrupt the electromagnetic fields around the copper. The whole assembly is then submerged in a tank filled with mineral oil which rises all the way to its brim.

To see one of these titans being made at the Siemens Energy factory in Nuremberg, Germany is to witness a remarkable mixture of scale, strangeness and craft skills (Siemens' attempts to do the winding by robot have so far failed). The finished products typically weigh 300 tonnes, cost €30m ($32m), and are ready for delivery about three years after being ordered.

Expanding the world's capacity to make such exotica is vital if grids are to expand quickly. But it is not easily done. There are few providers and they are cautious. Siemens is working on making its existing plants more productive, as are its competitors, but it is reluctant to build lots of new capacity for what it sees as a one-off spike in demand. So are its competitors.

The expectation that lots of new equipment will never be needed very quickly is one the legacies of steady-state grids. Another, linked legacy is a low appetite for investment.

For most of the past half century the governments which owned many national grids and the bodies which regulated grids in the private sector focused on two main goals. The first was that grids be stable and secure; that the lights be kept on and industry humming. The second was that grids should add as little as possible to the price of the electricity they supplied.

For the most part, the grids met these goals. Consumers in most of the rich world can rely on the fact that, except under the most adverse of circumstances, the flick of a switch will illuminate their homes and the food in their freezers will not thaw. This certainty has been provided quite cheaply. Ben Wilson of National Grid, which owns and runs Britain's transmission infrastructure, says that in 2019 the cost of the grid accounted for just £20 ($25) of the average consumer's electricity bill of £1,300, a mere 1.5%.

But conservative regulation offered no incentive, or scope, for strategic investment. Grids could spend only what was needed to provide connections for projects which were guaranteed to get built or to alleviate chronic congestion. Connection requests were typically dealt with on a first-come-first-served basis, to make things fair, rather than by some other mechanism such as auction or a strategic plan.

That is not good enough for a world which wants to replace the vast majority of the plants currently generating its electricity, and which will often need to build the replacements in different places. An inability to provide enough grid connections means that all around the world new generating projects face lengthening queues before they can get onto the grid. Those queues do not just slow the rate at which new capacity becomes available. They also add to uncertainty and thus increase the cost of investment. Zoisa North-Bond, chief executive of Octopus Renewables, a British energy firm, has called grid access the "biggest limiting factor" to increasing the market share of renewables.

By some estimates there is a terawatt of renewable capacity in America's queue for connections

In 2022 about 54% of Britain's electricity was generated without emitting carbon; its grid is one of the most deeply decarbonised in the world. But that does not mean it has solved the queue problem. On average, the projects connected to the grid in 2022 were doing so about four years after the date they had requested. The company developing Berwick Bank, SSE, should have all the wind farm's capacity installed by 2030—but at least one part of the farm is due to connect to the grid only at the end of the following year, according to published data. A supplier asking for a grid connection today can expect to be offered one for some time between 2030 and 2038.

There is a real limit to how fast connections can be provided. Expanding the grid changes its properties and thus risks its stability. But today's delays are much longer than necessary. Mr Wilson of National Grid says the queue has grown to its inordinate length because, until very recently, Britain's grid regulator, Ofgem, allowed no investments in upgrades before a connection request had been signed on the dotted line. It might be obvious that a country betting big on offshore wind as a new source of power would need strong grid connections to the North Sea and the Atlantic. But they could be invested in only once National Grid had specific and detailed requests from individual developers. As well as slowing investment, this sort of bottleneck also increases permitting time. Only after the generator's planning and permitting is completed can the equivalent process for the grid connection start. In engineering terms, what could be done in parallel is being done in series.

But perhaps the biggest cause of queue length is speculation. In 2008, in an effort to incentivise the connection of small-scale renewables, National Grid made applying for a connection much easier. That made it possible for speculators to file "paper projects" in the hope of flipping their spot in the queue to a project behind them. Such projects may make up as much as 80% of the queue; many have no designs prepared nor engineers on staff that might carry them out. Weeding them out would seem an obvious step. But the regulatory regime does not give National Grid the tools with which to discriminate between builders and flippers.

Much the same is true in many other countries. Thomas Egebo, the boss of Energinet, the state-owned firm which owns and operates the Danish grid, says the state of affairs is "exactly like in the UK. There needs to be a project and we need to sign things and then we can apply to build [new grid capacity]."

The situation in America, which has many grids and even more lawyers, is dire. A study published last year by Lawrence Berkeley National Laboratory in California found that the average grid connection in America in 2021 had taken three years to be completed, and that, as elsewhere, the lag was getting longer. By some estimates there is at least 1,400GW of new renewable capacity in America's queues for connection.

Here comes the sun, traffic permitting

Chill Sun Solar, which shares the queue to connect to the Californian grid with about 220GW of other solar plants and energy storage facilities, may be in luck. A new transmission line called Greenlink Nevada, designed to serve solar generation in that state, is currently being planned by the Bureau of Land Management and is due to be in service by 2026. But like the rest of America's planned energy infrastructure, it will be at the mercy of a permitting process which is vulnerable to court cases and delays.

As the Greenlink plan shows, there is some progress, and regulators are beginning to understand that there needs to be more. In December 2022 Ofgem published new rules, drawn up over eight frenetic months of consultation, allowing National Grid to go ahead and expand in advance of grid-connection requests. It is also reforming its procedures so that projects in the queue can be required to hit milestones or lose their place, though it is leery of making the rule retroactive (which would be needed to shorten the queue quickly).

In America the Federal Energy Regulatory Commission has expressed concern that grid operators "may not be planning transmission on a sufficiently long-term, forward-looking basis to meet transmission needs driven by changes in the resource mix and demand", and last year gathered feedback on proposals designed to push grid operators to invest according to longer term plans as a way to end today's "piecemeal and inefficient development". Its new proposals are expected this summer.

There are also plans afoot to reduce the delays planning permission and building permits can cause. In November the European Commission, the executive of the European Union, agreed to a new set of temporary regulations giving renewable-energy projects a "presumption of overriding public interest". The commission also agreed that "environmental-impact assessment for grid reinforcements should be limited" in order to "facilitate the integration of renewable energy".

Red queens racing

Such moves are vital when it comes to building new long-range connections, which may be required to relieve congestion as the grid expands, or to connect generators and loads across large distances. The construction of Ultranet, a series of high-voltage cables that will link wind power from the North Sea to industrial users in southern Germany, requires its developers to obtain some 13,500 building permits, says Tim Holt, who sits on Siemens Energy's board. "The tech is ready, but the permits are not." In February massive transformers destined for Ultranet were sitting ready for shipping at the company's factory in Nuremberg.

In the developing world, where grids are typically too small to meet today's demand, let alone the future's, some of these problems look less fraught. Expanding a growing grid further will often be easier than booting a mature grid out of its slumber.

India, for instance, has built out its grid at a furious pace in the past decade. Its Ministry of Power reports the construction of 161,000km (100,000 miles) of transmission lines since 2014, when Narendra Modi became prime minister. The percentage of the population which has access to a grid connection has shot up from 76% in 2010 to 99% in 2020, according to World Bank data.

The existence of connections does not in itself mean a stable supply. Keeping supply and demand balanced often requires load to be shed, leading to blackouts across India's cities. But according to the Ministry of Power the amount of kerosene used to keep generators running in rural parts of India fell from 9bn litres to 2bn litres between 2015 and 2021. That suggests that people were able to rely on the grid to provide much more of the energy they needed.

As the demands of grid decarbonisation have become apparent, India has simply kept building. In December 2022 the ministry announced that it would spend 2,440bn rupees ($30bn) to build another 50,000km of electricity transmission lines by 2030 to connect renewable generation, often in fairly remote places, to growing demand. It is planning to connect 500GW of renewable capacity of all kinds by the same date.

India's huge grid expansion might seem to run counter to a popular narrative about developing-country electrification. It has often been suggested that building big, centralised grid infrastructure was too slow, expensive and wasteful in these markets. One alternative might be a more rapid growth in distributed generation, specifically solar panels, that could be connected into local microgrids. Each microgrid would be capable of running as an independent island, but also able to exchange energy with its neighbours. There would be no need for any big grid backbone, because solar panels would be plentiful and distributed widely enough that there was always enough electricity being generated nearby.

In truth, though, this is something of a false opposition. Distributed solar panels are capable of pumping out lots of electricity. But as Brent Wanner, the grids guru at the International Energy Agency, an intergovernmental think-tank, points out, making such resources your mainstay is a costly undertaking. Economies of scale make small-scale or rooftop solar "several times more expensive" than the same capacity would be if installed at a grid-connected solar farm. Distributed solar panels can reduce the demands on an existing grid by supplying some energy locally, but the economic case for a wholesale move to decentralised power has yet to be made. Developments of both sorts are needed.

China inclines towards big grids. State Grid, which runs the synchronous grid that spans most of the country, is the world's largest employer and runs its largest machine. Like India, China is benefiting from the momentum of recent grid expansion. The country only reached 100% electrification in 2012, at a point when the immense demands of grid decarbonisation were already becoming apparent and investment in infrastructure was being used to drive the economy.

As a result it has simply continued to invest. That said, it too is seeing increasingly long queues for connection, according to Chongqing Kang, who studies electricity systems at Tsinghua University in Beijing. He thinks the lack of real-time pricing is part of the problem. Those trying to transform the grid are left asking the government to update its policies.

Even with all the planning reform and queue-management wizardry in the world, the waits will not all go away. Construction of grid infrastructure cannot be done on a purely laissez-faire basis. Each grid is a single, cohesive machine, and new connections must be made carefully so as not to upset their delicate balance. The same is true of the new transmission capacity needed. But there things are being made easier by a 19th-century technology that is only now coming of age. ■

HVDC

Direct delivery

Bigger grids with more renewables need a new sort of plumbing, too

When you hear the word "transistor", you probably think of the little on-off switches which sit in their millions on silicon chips. If a name comes to mind it is probably William Shockley, the Bell Labs researcher who invented that particular sort of semiconductor device in 1947, or Gordon Moore, who first spotted the trend for them to get smaller, cheaper and better all at once (and who died in late March).

When a power engineer hears the word, though, they may well think of switches built for brawn, rather than miniaturisation, and of Bantval Jayant Baliga. Born in Chennai in 1948, Mr Baliga applied the principles of semiconductor physics to the control of currents, rather than to calculations. In 1980, while working for General Electric, an American conglomerate, he patented a new kind of semiconductor which is quietly changing the world: the insulated gate bipolar transistor (IGBT).

Like all transistors, IGBTs are on-off switches controlled electronically. They make it possible to apply fine-grained electronic control to switching high voltages and large currents. This improves the world in all sorts of ways. Mr Baliga is particularly proud of what has been achieved by using them in internal-combustion engines. Estimating, quite reasonably, that their use in ignition systems has made the world's cars 10% more efficient, he argues that they reduced demand for gasoline by a staggering 42bn barrels between 1990 and 2020. His calculation ignores the fact that with less efficient cars people might have driven less far. But it is hard to begrudge him the oversight, especially since his invention is not yet done helping the climate.

The alternating currents used in grids have lots of advantages. But they are not good for sending a lot of power over long distances. Long-distance AC lines require booster stations along their length to make good the losses imposed by the magnetic fields that are generated in the process of transmission. Long-distance direct-current (DC) lines have no such losses to make up. This attribute saw people experiment with them all over Europe in the late 19th and early 20th centuries. The technology was incredibly cumbersome and unreliable, and the other advantages of AC grids saw them continue to dominate distribution. But DC connections held out in a few marginal niches, biding their time.

Converting AC to DC was one of many jobs in which the vacuum tubes used in the first half of the 20th century were replaced by semiconductors in the second half. They offered improvements, but they still had problems—one of which was that it required the full power of an AC grid to get high-voltage DC (HVDC) lines going. When China built HVDC lines to bring solar and wind power from the north and west to the eastern seaboard in the 2010s it had to build coal-fired power plants alongside them to start them up.

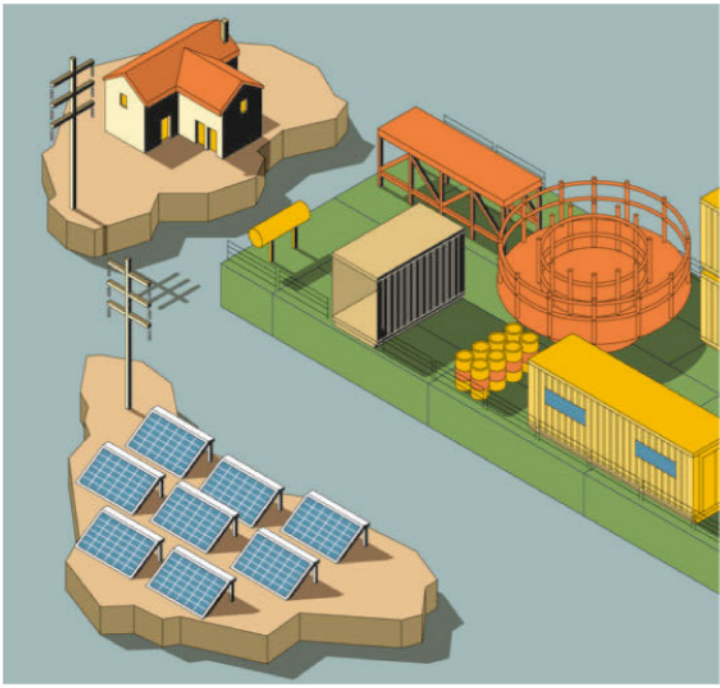
The warp cores

Technology which uses IGBTs does not have that problem. It also offers much more flexible switching, making the conversion process much easier, and takes up less space. That has proved quite the advantage. Mr Holt, the Siemens Energy board member, says that 99% of the HVDC systems now sold are based on IGBTs. And its attractions are also making the overall market larger. HVDC is not just a way to link far-off generators to existing grids, as in China and a number of developing countries with big, remote dams. It can also provide bridges from one part of a grid to another, thus easing congestion. And it can link together grids that could never be united into a single AC system.

By the standards of semiconductors, IGBTs in action are an impressive sight. In the main hall at the Blackhillock HVDC converter station in Aberdeenshire, in Scotland, they hang from the ceiling, mated to other components in great metal banks which are threaded and wrapped with veins of coolant. When Blackhillock is operating, no one can enter the hall lest the enormous voltages flowing through these valves, as they are still called, determine that living flesh is the quickest route to ground. Your correspondent was only able to see them thanks to a maintenance break.

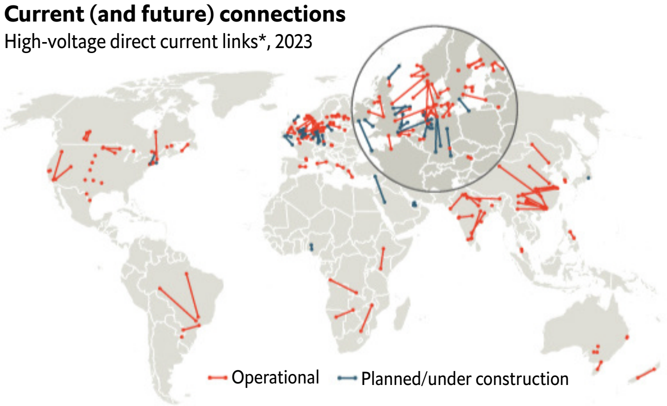
If the valves look like a cross between a server rack and an outsized engine, the appearance is not all that deceiving; this is where current meets computation. The valves, which Hitachi Energy makes using IGBTs from a specialist manufacturer, use components called capacitors to store small amounts of electric charge for brief periods of time. The IGBTs control the charging and discharging in such a way as to turn the AC input into a continuous DC output. They can also work the other way round, charging and discharging the capacitors in a way which turns incoming DC into AC.

Blackhillock is the south end of an HVDC link which runs under the Moray Firth to Caithness, in Scotland's north. The growth of wind farms across Caithness has outstripped the capacity of the local grid; to keep it stable some of the farms are turned off on windy days and their owners reimbursed for the electricity not sold. In 2021 such curtailment payments in Scotland reached £382m. The Caithness-Moray link provides that electricity with a new route south, reducing curtailment and giving relief to the grid.



Current (and future) connections

High-voltage direct current links*, 2023



Sources: Hitachi Energy; Siemens Energy

*Hitachi Energy and Siemens Energy projects

Linking one point on a synchronous AC grid to another, as the Caithness-Moray link does, is an increasingly popular way to relieve grid congestion without building out new AC capacity (reinforcing the AC grid throughout the Highlands would have been much more expensive). Such links do not just help the operators; they help consumers, too. Before the Alegro interconnector was completed in 2020, grid congestion frequently meant that the cheapest electricity being generated in Germany could not get to Belgium except through the Netherlands or northern France. Providing a direct link has reduced prices in both markets. Many such congestion-relieving schemes are under construction in Europe.

Another application of HVDC is to connect independent grids that cannot simply be merged into a bigger synchronous system. The North Sea Link, an HVDC cable between Kvilldal, on Norway's west coast, and Blyth, on England's east coast, allows energy to flow between Statnett, Norway's grid operator, and Britain's National Grid. At 720km (450 miles) it is currently the longest subsea electrical cable in the world. But it won't be for long. Viking Link, currently under construction between Lincolnshire, farther south in England, and Jutland, in Denmark, will soon take its crown.

The technology is also being used, as in the past, to plug far-flung renewables into the grid. Even when the sophistication of IGBTs is not needed (for example in links where current will only ever flow one way) their small footprint stands them in good stead; space is at a premium on offshore platforms. Sometimes, though, their sophistication matters. "Multiterminal" HVDC, only possible with the flexibility and control offered by IGBT-based conversion, will allow big offshore wind farms to serve more than one grid, and to act as links between all the grids which they serve.

The northern converter station of the Caithness-Moray link will eventually become multiterminal. Power will run into (or out of) it not just from Blackhillock to the south but also, via a cable now under construction, from the Shetland Islands to the north and from new wind farms built off the coast. This will mean that on a given day, depending on the needs of the grid, energy can be

sent from the Shetlands to Aberdeenshire, or from offshore wind farms to the Shetlands, or a bit of both. Denmark is planning to build two huge "wind islands" equipped with multiterminal HVDC. The turbines on both will be connected not just to Denmark but also to its neighbours, allowing electricity to be sent in either direction. Belgium is building something similar.

Perry Hofbauer, an HVDC engineer at SSE, calls this expansion of the grid demanded by decarbonisation the "biggest change to the power system in history". But once you complete that great challenge of expansion, you face the wicked job of balancing it. ■

Storage and demand management

Defying Dunkelflaute

Grids must balance supply and demand. But sometimes supply goes away

IN PULHEIM, A small town in North Rhine-Westphalia, three people are looking after the grid run by Amprion, a German systems operator. Their workspace has a hushed atmosphere, something between a theatre and a church. Both the lighting and walls are soft. A vast screen, five metres high and 20 metres wide, sits concave in front of their desks. It displays a circuit diagram of the grid Amprion manages in Germany and of the other grids onto which it abuts. Amprion's grid is an integrated part of the Continental Europe Synchronous Area (CESA), which covers 24 countries from Portugal to Poland. All told, it can call on some 900GW of all sorts of generating capacity.

The operators' daily routine used to be relatively simple. Twenty years ago, when 65% of German demand was met with fossil fuels and 27% with nuclear power, the predictable increase in demand that came each morning was met by automatically ramping up coal and gas plants. After the evening peak, those plants would be returned to their lowest output levels. It is a bit like trying to ride a fixed-gear bike at a constant speed. On the up you push harder; on the down you provide a little resistance to stop yourself from careening out of control.

Today the nuclear fleet is being shut down and there is more wind and solar on the grid than coal. This means one day may be very unlike the next. In 2021, at 11am on a sunny, windy day in July, the German grid got 72% of its electricity from wind and solar. One month earlier, at 2am on a still night in June, less than 1% of electricity was flowing from the same sources. Keeping the bike at a constant speed has become a real headache. Amprion has become an avid consumer, and indeed producer, of weather forecasts. "If there's a wind front coming in then we have lots of work to do," says one of the Pulheim operators.

Seasons in the sun, and out of it

Over short periods some of the balancing between supply and demand can be done using batteries, typically those which use lithium-ion chemistry to store energy. The cost of Li-ion batteries has plunged thanks to the huge increase in demand provided first by smartphones and then by electric vehicles. They are now cheap enough to be put on the grid in large numbers. In some places the dropping cost of battery storage is allowing it to replace the "peaker" gas plants previously used to deal with over-the-top demand.

But batteries are no match for the fact that winter is consistently less sunny than summer. Systems in mid to high latitudes will always need to be designed to cope with different average generation levels in different seasons. On top of that there is the challenge of what meteorologists call "anticyclonic gloom" and grid operators have come to know as *Dunkelflaute*, a German word meaning "dark doldrums". Amprion's Julia Watzlawik says that in January and February the country can see whole two-week periods with almost no wind and limited solar power. Under such conditions the gap between renewable supplies and what the system needs can reach 50GW. That gap, some 60% of peak demand, is filled by burning more fossil fuels and importing electricity of all sorts from elsewhere.

Part of the attraction of CESA is that it makes imports easier. Being part of a continental scale grid provides access to electricity from nuclear plants and renewable resources in other countries. A recent study by Bowen Li and colleagues at the Delft University of Technology found that "*Dunkelflaute* events do not occur at the same time in all the countries surrounding the North and Baltic Sea areas…it may be possible to significantly reduce the adverse effects of *Dunkelflaute* via grid interconnection."

That means more long-distance HVDC links between different parts of CESA would be a help. But it is not a complete cure. "I don't think that we can manage…the European grid so that we always have, at the right time, enough [zero-carbon] energy to serve all Europe," says Frank Reyer, Amprion's operations manager. The Bay of Biscay may be blustery while the Baltic is becalmed, but wind turbines off the Atlantic coast of France cannot be expected to make good all of Germany's shortfall. "France needs energy as well," says Mr Reyer.

There are two ways to deal with the problem. One is to require the electricity system to do on a huge scale something that it has done very little of to date: store energy in large amounts. The other is to take more active control over demand.

Storage does not fit easily into the generator/grid/user paradigm on which modern electrical systems are based. In some applications it is like generation—a source of energy for the grid to draw on as and when demand demands. In others it offers a way to shift demand, for example with storage heaters that take on power when it is cheap overnight to provide warmth later on. Either way, though, it is not something the grid can do itself. Some energy is inevitably stored in both electric and magnetic fields around grid components, providing a source of what grid operators call "reactive power"; that power can be drawn on to limit voltage fluctuations. But it is not a store of energy that can be used by consumers.

Batteries are increasingly important to help over short time frames; grids relying on renewables are ever more dependent on them. But it would be unfeasibly expensive to use batteries to provide storage on the scale required to make good weeks of serious supply shortfall.

An uphill challenge

Many grids have access to "pumped-hydro" plants in which water from a reservoir is used to drive turbines when extra power is needed and pumps then refill the reservoir when power is plentiful. If your grid area has the sort of mountains that provide valleys at a significant elevation (think Norway, or the foothills of the Himalayas) this technology can do a lot. But storage far from the cities of the plains is not ideal. And a big pumped-hydro plant can store maybe ten gigawatt-hours of power. When a deficit is in the tens of gigawatts and lasts for weeks, something more is needed.

The "something more" of choice, according to most analysis, is hydrogen made by electrolysis—the splitting apart of the hydrogen and oxygen in water molecules. Such hydrogen can be stored until extra power is needed, at which point it can be burned in a turbine—a process that, unlike burning natural gas, releases no carbon dioxide. Such stores can provide a lot of energy. The designers of the Advanced Clean Energy Storage Project in Delta, Utah, think that they can store 300GWh of hydrogen in one pair of salt caverns. That alone is equivalent to half as much storage capacity as that which all the world's Li-ion battery factories provided last year.

Mr Reyer believes that this kind of "power-to-gas" will be crucial for Germany during periods of post-fossil-fuel *Dunkelflaute*. What is more, hydrogen made this way could replace fossil fuels in other applications, too, such as steel-making and fertiliser manufacture. But that depends on there being both a lot more renewable, or nuclear, energy available with which to make the hydrogen, and on there being yet bigger grids to move that energy to the places where it is needed.

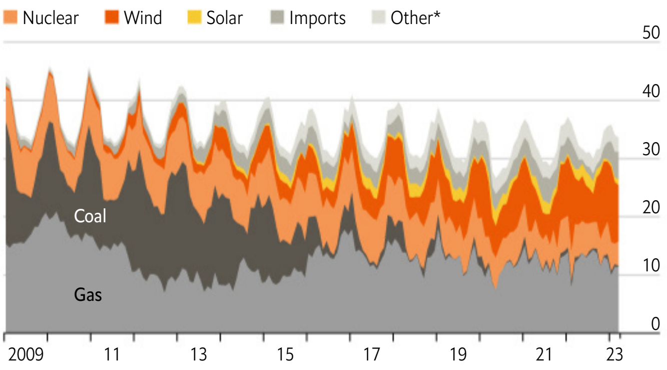
One pair of salt caverns can store half as much energy as all the lithium-ion batteries made last year

[redacted]

Battery storage is often located next to the renewables that charge it, and some suggest that electrolysis should be dispersed in the same way, using up surplus energy from renewables or nuclear plants when the grid does not need their power. Luke Johnson, the boss of H2 Green, a British firm that plans to build hydrogen-production hubs, is having none of it. For hydrogen production to be economic, he says, it must be done through the grid.

Changed world

Britain, average daily electricity generation, GWh



Source: National Grid Electricity System Operator

*Biomass, hydro, storage and other fuel types

One of his reasons is that making hydrogen is best done on an uninterrupted basis, not least because the capital costs are harder to bear if the plant works only some of the time. Another is that he wants his hubs to support trucking, shipping and heavy industry. That is much more easily done in existing industrial centres than in the seas, deserts and distant windy plains best suited to large-scale renewables. And moving hydrogen through newly constructed pipelines is a lot harder than moving electricity through expanded grids.

Grid hydrogen would not, at present, be as green as that made directly from renewable energy at the point of production. But the greener the grid gets the greener the hydrogen gets. When countries reach the goal of an emissions-free grid, hydrogen made using its power will be emissions-free too.

If a grid-powered hydrogen industry would be a major source of demand, though, it could also be a new source of balance. Electrolysers don't like being turned on and off, but they can be ramped up and down. That could make hydrogen production a way to help with the other response to periods of insufficient supply: demand management.

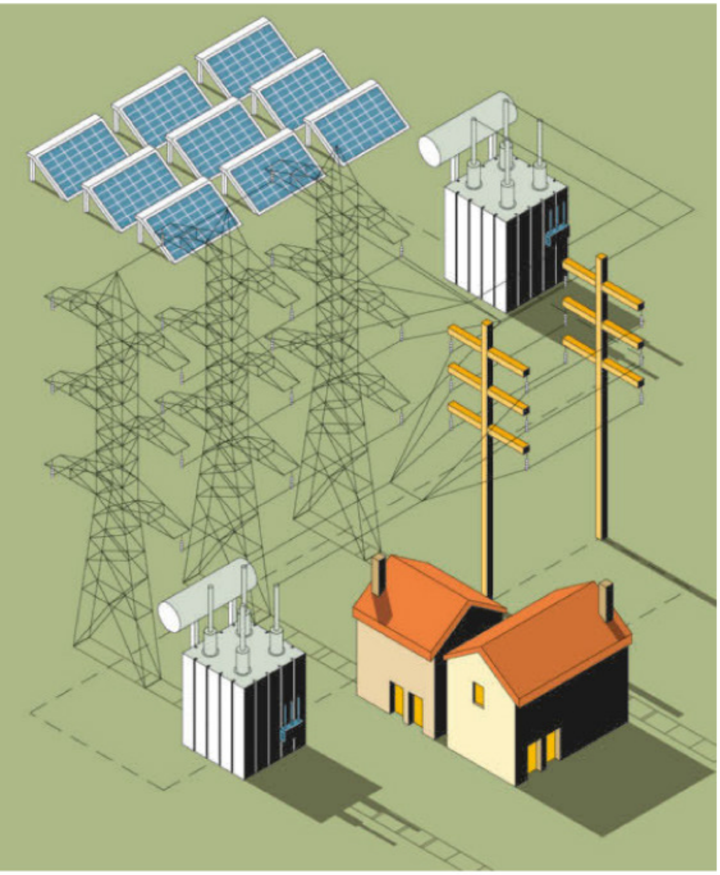
A lot of industrial load is not particularly time sensitive; give it price signals and it will respond accordingly. Industrial freezers, for instance, can be cooled well below their required temperatures when energy is cheap, then allowed to warm back up towards their maximum safe temperature when it is dear. Consumer load can be raised and lowered too—as long as the consumers are not inconvenienced and don't have to think about it.

Octopus, a British utility, is one of the companies trying to make demand management hassle free. Their customers allow the company to control things like the rate at which their electric cars recharge themselves, or at which their heat pumps warm their houses. To minimise the customers' uncertainties and concerns they are able to set specific expectations, such as how well charged their car will be at 8am. Octopus's job is to juggle all these obligations in a way that allows it to sell the option of demand curtailment to grid operators at times when they might need it while giving rebates to the customers.

As yet, Octopus is not making much money. It hopes that more electric vehicles and heat pumps alongside a stronger market for demand management will put that right. It also hopes that by making its demand-management platform, Kraken, widely available to others it will encourage demand management to become widespread, a development that will be good for the companies best at providing it. Such a broad shift is clearly necessary. Scenarios from the International Energy Agency which see the world reaching the climate goals set in Paris in 2015 have 500GW of demand-side response installed by 2030. The current total is 50GW.

There is no doubt that, for the energy system as a whole, dealing with the intermittency of renewables is the biggest challenge attendant on decarbonisation. Big grids, interlinks to far-off resources (particularly to sunny lands to the east when people are getting up in the dark, and to sunny lands in the west as they settle in for the evening) and new forms of storage will all be required, as will demand management.

But for the grid itself, the issue is not just making new sources of electricity more available for more of the time. The nature of the sources matters, too. Grids built up to serve steam generators working at 50Hz or 60Hz have not just become accustomed to the peculiarities of a system powered by huge lumps of spinning metal. They have learned to make use of them to keep the grid stable. Take most of the steam turbines off the grid and you do not just have to replace the power they used to provide. You also have to find new ways to stop the grid from falling over. ■



Inertia and the future

Back in black

The physics of rotating masses can no longer define the grid. In the long run, that will make it better

TUCKED AWAY behind a cash-and-carry in a Liverpool suburb is a 40-tonne cylinder of steel spinning 1,500 times a minute. Its 500 megajoules of kinetic energy are the equivalent of the chemical energy stored in 100kg (220lb) of TNT. To keep the cash and carry and other neighbours safe, the whole contraption is cocooned in steel-reinforced concrete; on one side of the cylinder a rubberised steel pit waits to catch it should the numerous redundant safety systems fail.

Why store what is, in grid terms, a relatively small amount of energy (140 kilowatt-hours) in such a potentially perilous way? Because a balance of supply and demand is not the only thing needed to keep the grid up and running. Making sure the frequency stays stable, and thus that the rest of the show stays on the road, depends on other factors—things that are provided free of charge when you connect a big lump of fast-spinning metal to the grid, but not when you add on renewables. The "synchronous condenser" at the Lister Drive Greener Grid Park provides some of the spinning-metal mojo that the increasingly renewables-heavy grid lacks. In the future, though, more thoroughgoing approaches will be needed, approaches which obviate the need for any spinning metal at all, and which allow both grids and the people connected to them freedoms which they have never previously enjoyed.

The synchronisation between the spinning steam turbines of coal, gas, hydro and nuclear plants and the grid they supply is a two-way street: the electromagnetic fields which couple them mean that conditions on the grid reach into the workings of the generators, and vice versa. This means properties of the spinning metal and its connections propagate out onto the grid. One such property is inertia; the turbines' innate desire to keep spinning limits the ease with which the grid's frequency can fluctuate. Another is "reactive power", a drag which the nature of alternating current imposes on the flow of energy through the system, and "short-circuit current". Reactive power can be used to deal with voltage fluctuations. Short-circuit currents reveal faults and can be used to clear them. Because these aspects of the grid-as-it-is are so useful to its operation, they are referred to as ancillary services.

Tenets and turnstiles

Solar panels, wind turbines and batteries are connected to grids through carefully controlled electronics, rather than through the brute force of electromagnetism. The DC power which solar panels and batteries provide is turned into AC by inverters which mostly use technology like that found in the valve rooms at the ends of HVDC connections. The low and variable frequency AC produced by wind turbines is processed in similar ways. As a result, batteries and wind and solar farms are all referred to as "inverter-based resources" (IRBS) in the trade.

The problem with this is that, at present, grids in which IRBS provide more than 60% of the power energy start to become seriously unstable without help, according to Ben Koproski of America's National Renewable Energy Lab in Colorado. The vast majority of today's inverters are "grid-following" ones, spitting out current with characteristics that match those that the inverters see on the grid. This means that unlike turbines they provide no way of pushing the grid in a preferred direction. Indeed they can worsen conditions by amplifying existing imbalances.

One way to deal with this is through "spinning reserve": gas-fired stations in which the turbines are kept spinning while generating very little power. But this is very capital intensive and burns natural gas in a peculiarly inefficient way. So grid operators are increasingly willing to pay for alternatives. The turbines at Drax earn money this way, as do those of Cruachan, a Scottish pumped-hydro facility that Drax bought in 2018. So does the synchronous condenser at Lister Drive, a facility set up by Statkraft, a Norwegian utility. And so does a 100MW battery which Zenobe, a British battery company, has plugged into the grid not that far from Lister Drive. (The closure of Fiddler's Ferry, a large coal-fired power plant, led to a worrying shortfall of ancillary services in the Liverpool area, which has thus become a place where new approaches are being tried out.)

This installation is special not because of its batteries, but because of its inverters; rather than being grid-following, they are grid-forming. This means that they can be programmed to provide the grid with energy in exactly the form and at the frequency that the grid operators require, making up for the loss of ancillary services. Grid-forming inverters offer a step change away from the world of instantiated electromagnetism and into a realm of code and electronics.

The hardware which runs grid-forming systems is, for the most part, little different from that in grid-following systems—but the algorithms which shape the current that flows through them are much more sophisticated. And the approach does not have to be limited to batteries. In time all the inverters in front of wind farms and solar plants could all be grid-forming; in some cases, according to Mr Koproski, the change could require nothing more than a software update. In terms of grid stability, this would turn IRBS from a problem into a solution. Mr Koproski sees this as turning an old saw about renewables on its head. With the right electronics, adding renewables and the storage which comes along with them to the grid can make it more stable, not less. ▸▸

Grids with ancillary services provided by the inverters in front of renewable sources should in the end, be easier and cheaper to run than those of days gone by. Easier, because the operator of a grid supplied with electricity entirely through grid-forming inverters would not need to put quite so much effort into keeping grid frequency and voltage stable across the system as a whole. With all connections capable of easy adjustment, the consequences of wandering frequency could be headed off. To use the fixed-gear-bike analogy, the algorithms in the grid-forming inverters would simply look at the pedals of the transmission system spinning beneath their feet and gently, with a computer's perfect timing, start pedalling again in whatever way suited them.

What limits to growth?

Making things easier has implications for the speed at which grids can be expanded. Leaving aside bureaucracy, speculation and permitting, adding lots of new supply to today's grids remains an often painstaking procedure. If new resources all come with grid-forming electronics, things should become a good bit more plug-and-play; the new additions will be able to match themselves more closely to what the grid needs at that location, rather than requiring the grid to adapt itself to them.

The fact that they already offer similar capabilities is one of the factors behind the spread of HVDC links. The grid-forming potential of the connection halls on SSE's Caithness-Moray link have led the company to consider equipping them for the ultimate act of grid formation: a "black start". Re-starting a grid that has collapsed is a tricky business. The generators attached to steam turbines need to be spun up by auxiliary diesel power to manage it; grid-following inverters are no good at all when there is no grid to follow. Grid-forming services make things much easier—especially when connected to wind turbines generating large amounts of power, like those in Caithness.

Grids have long been targets in times of war: Ukraine's has been pummelled by Russian missiles and shells

[redacted]

Such added attraction will increase the appeal of HVDC, and as demand increases the technology will become cheaper. That will further drive demand in turn. It will also make ever more ambitious interconnections conceivable.

It is possible to get ahead of the curve on this. Sun Cable, a company which had plans for a 4,200km cable that would feed Singapore with power from Australian renewables, recently went bust. XLinks, a startup, is promoting a scheme which would bring Britain a constant 3.6GW of power from renewable sources and battery backup in Morocco; its cost is put at £18bn ($22bn), with 3,800km of proposed cable a big part of the total. If XLinks prospers, more such projects will surely follow.

That said, such gigalinks bring with them concerns beyond the cost of finance. Even before the bombing of the Nordstream 2 pipeline in the Baltic, the idea of getting a significant fraction of your power from a single vendor through that long an umbilicus raised questions about political risk which are beyond the power of technology to address. Direct connections can bring with them dependency and vulnerability.

Grids have long been targets in times of war: Ukraine's has been pummelled by Russian missiles and shells. They are also attractive targets for cyber-attacks. The need for grid balance means that attacking a relatively small component can produce devastating results as the effects ripple through the system. The more firmly a grid is tied to outsiders whose security is beyond your control, the more worried you might have cause to be.

An electronically formed grid, with more need for computation and communication, might make such vulnerabilities worse. And as electricity becomes the primary source of energy for more and more applications, attacks on the grid could become even more frightening. Blackouts that turn off the lights and air conditioning today could cripple heating and transport, too, in a few decades' time. That said, the possibility of an attack on a single weak point causing a cascading failure across the grid should be reduced by robust electronics. Making grids bigger has benefits, too, if their further-off parts can be robustly defended. Getting the Ukrainian grid synchronised to CESA soon after Russia's invasion helped the country a lot.

These potential benefits are all secondary to the fact that the world's grids have to change if the world is to decarbonise at the rate climate policies demand. That change will necessarily be complex and costly, whatever the technology, with investment measured in tens of trillions of dollars. But it is worth noting that, done properly, this huge and necessary shift will not simply allow the world to continue as it did when burning fossil fuels. By making energy easier to move around than ever before and allowing the most cost-efficient generation to capture more of the market, it will over time make that power cheaper. Robust grids to which cheap generation can be added easily will be able to provide an energy abundance today's fuels never could.

One of the biggest advantages is that a significant amount of the antagonism between advocates of ever more muscular grids and more decentralised systems may wither away. Grid-forming inverters allow microgrids and macrogrids to be joined together far more easily. They also help consumers attached to grids to build out their own generating and storage systems in a way that the grid can draw on. As long as some standards are adhered to, what happens behind the inverter can stay behind the inverter. But power can get in and out.

A virtuous circle in which the growth of the grid makes it easier for electricity resources to grow further would not be unprecedented. There was a similar positive feedback loop in the old energy system, too. Better engines and generators made fossil-fuel extraction, distribution and consumption cheaper, which made it possible to feed ever more engines and generators. But that growth faced two sets of limits. One set was imposed by economic and political constraints on fuel supply, the other by the degree to which the environment could absorb the unavoidable waste. Ingenuity, investment and statecraft could be used to move the first limits back; short-sightedness, vested interests and the sheer scope of the problem contrived to have the second set of limits ignored. But neither set of constraints was abolished. And neither applies in the same way to an electricity dominated system fed by renewables and nuclear power, supported by adequate storage, and connected by a flexible, stable, electronically enabled grid.

Nothing can get better for ever. The fossil-fuel-free energy system that new grids will enable will surely face constraints of its own. But they will not take the form of a limit on its fuels, and they will not be found in the damage done when the Earth's basic cycles are wilfully disrupted. The upfront costs of building out the grid are vast. The challenge of meeting the fossil-free electricity-supply goals required if the climate is to be stabilised are insanely daunting. But once the shift gets well under way, and costs start to tumble, there is no telling where things will stop. ■

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Farming in the world's breadbasket

When the tortillas run out

LA ESPERANZA, HONDURAS AND ROSARIO, ARGENTINA

Crazy policies and climate change are hurting Latin American agriculture

When billions of black bugs invaded Buenos Aires in March, locals were mystified. Social media buzzed with queries. They turned out to be thrips, leaf-munching insects escaping from the drought-denuded Argentine countryside for better-watered urban gardens. They pose no threat to people. But the extreme weather that prompted their exodus does.

Across Latin America, climate change is making it tougher to grow crops. That could have two alarming consequences. It will be harder to ease rural poverty, since small farmers will find it trickier to eke out a living. And it could affect the global food supply, since Brazil and Argentina alone provide a tenth of the world's wheat exports and a third of those of coarse grains (barley, maize, oats, rye and sorghum).

No model can reliably predict farm yields, as future changes in technology are unknowable. However, the Inter-American Development Bank takes an average of nine climate models and combines them with crop and economic models to produce some estimates. It projects that by 2050 growth in regional agricultural production will be five percentage points lower than it would have been without climate change. The region's population, meanwhile, is expected to swell by 14% between now and its peak in around 2056.

Such headline figures disguise enormous variation. The region stretches more than 10,000km north to south, spanning deserts, mountains, rainforests and open pampas. Conditions for growing maize, a particularly heat-sensitive crop, will grow worse nearly everywhere, whereas those for soyabeans, a hardier plant, may improve (see maps on next page). Wheat production may have to move southwards.

Roughly speaking, the hot, dry parts of the Andean countries, Central America and Mexico (the biggest supplier of vegetables to the United States) will probably grow even more arid. This will make life more precarious for the rural poor, and could spur mass migration or even unrest. By contrast the temperate "southern cone" of Argentina, Chile, Paraguay and Uruguay could become more hospitable for crops such as soyabeans and rice, creating an opportunity for big commercial farmers to raise yields. The main obstacle to seizing this opportunity is that Argentina, the southern cone's largest producer, has some of the craziest farm policies on the planet. Meanwhile in Brazil, the region's other agricultural powerhouse, the degree of pain will depend to a large extent on what happens to the Amazon rainforest. And throughout the region, the fortunes of big and small farmers will diverge.

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43 The political clout of evangelicals

"There's a disorder in the climate. When we expect one season, another comes," says José Adrián Reyes, a small tomato-and-chilli farmer in the highlands of Honduras. His homeland illustrates a grim truth: that the places most affected by climate change will be those least able to cope, not least because the hottest areas tend also to be the poorest.

Honduras is hot, poor, sandwiched between oceans, lashed by increasingly furious hurricanes and suffering deeper droughts. Average yields of maize are likely to be 9% lower in 2050 than they would have been without climate change, predicts the Inter-American Development Bank. That is a recipe for social upheaval.

If lower yields translate into higher prices, that will wallop the urban poor, who in Honduras eat maize tortillas with nearly every meal. And tougher growing conditions will hurt small farmers, of ▸▸

whom Honduras has legions. (Some 29% of Honduran workers grow things, double the figure for the region as a whole.) Small, poor farmers find it hard to adapt, not only because they lack capital but also because they are rationally reluctant to experiment. Generations of experience have taught them that if they try something unfamiliar and it fails, they face destitution, so they tend to stick with what they know.

Yet eventually they will have to adapt, or find another line of work, or join the long queue of migrants trekking towards the United States. So many Hondurans have already emigrated that the money they send home each year is the equivalent of a quarter of GDP. In the coming decades climate change will spur untold numbers to move from the countryside to cities.

Fear of mass migration is one of the reasons why the United States is backing projects to help small Latin American farmers use water more efficiently. Those who rely on the clouds to water their seedlings are especially vulnerable when the rains fail. In Mr Reyes's village near La Esperanza, an investment of $260,000 from the UN's International Fund for Agricultural Development has produced 50km of irrigation pipes, benefiting more than 1,000 families. Farmers are producing more on less land, and shifting from basic crops such as maize and beans to more lucrative ones such as greens and berries.

Big farmers in cooler parts of the region should find it easier to adapt. Argentina—huge, fertile and mostly temperate—is already the world's third-largest exporter of soyabeans and second-largest exporter of maize. Climate change will hurt some Argentine farmers—principally those in the north. But higher rainfall should boost yields of soyabeans, rice and irrigated wheat in large swathes of the country, especially in the south. And because Argentine agriculture is dominated by tech-savvy modern farmers, the country should be able to ramp up production.

Yet the mood among Argentine farmers is gloomy, thanks to the same drought that sent thrips swarming into Buenos Aires. Parts of Argentina received less than half their normal rainfall in the last four months of 2022. A study by World Weather Attribution, an NGO, concluded that this could be natural variability rather than a consequence of climate change, but that very high temperatures, which probably were caused by climate change, had made the drought more painful.

A group of farmers sit around a table in an impressive farmhouse near Rosario, in the north. Polo mallets hang from the wall. A fine spread of apple cakes greets visitors. But the wide fields are dry, and the wheat crop is down by 65%. The farmers would love to invest in new technology to adapt to climate change. Like most big farmers in Argentina, they have already embraced genetically modified crops, with excellent results. Unfortunately, they must continually react to government policies that arrive as unpredictably as swarms of locusts. "You can't plan for five years in the future because you have no idea what will happen next month," says Federico Boglione, whose family owns the farm.

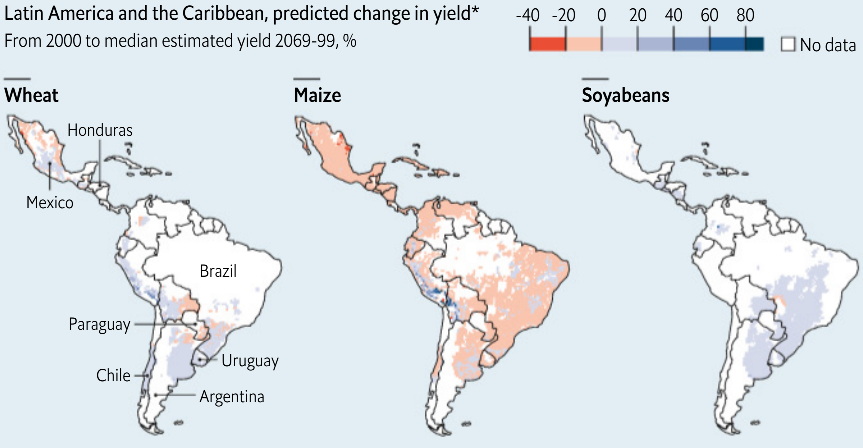
Some crops face export quotas. All face crushing export taxes. There are multiple exchange rates for the US dollar, depending on which crop you export. At the main official rate, exporters must surrender their dollars for roughly half what they are worth. Naturally, they resent this. Last year soyabean farmers hung onto their harvests, hoping that the government would eventually be forced to devalue the local currency. (Inflation in Argentina is over 100%, so even an unrealistic exchange rate must adjust from time to time.)

The government, desperate for hard currency, offered a special exchange rate just for soyabean exports, worse than the black-market rate but better than the official one, and said it would be available only for a month. The aim was to coax farmers to sell their beans. It worked, but only for a month. So a few weeks later the government offered the soyabean rate again; this month a third rate will be rolled out. On March 31st the government also introduced a separate exchange rate for wine exporters, dubbed the "Malbec dollar".

Seeds of change

Latin America and the Caribbean, predicted change in yield*

From 2000 to median estimated yield 2069-99, %



Sources: "Climate impacts on global agriculture emerge earlier in new generation of climate and crop models", by J. Jägermeyr et al., *Nature*, Nov 2021; *The Economist*

*Based on a low-emissions scenario (RCP2.6)

In theory farmers can buy imported inputs such as fertiliser with dollars at the official rate. In practice the process for obtaining cheap hard currency is slow and corrupt. Big farmers often have to barter—so many tonnes of wheat for a combine harvester, and so on.

Sensible policies could boost annual grain output from 140m tonnes today to 215m tonnes by 2032, or by 53%, estimates FADA, a think-tank. That is enough to feed 400m people. Plenty of boffins are eager to help. Bioceres, an Argentine biotech firm, has developed a new strain of drought-tolerant wheat that yields 30-40% more than the conventional sort when rains dry up. Some 50,000 hectares of it have been planted in Argentina; in March it won regulatory approval in Brazil.

Soya scenes

Latin America's other agricultural giant, Brazil, has both big dynamic commercial farmers and small unproductive ones. The former generate two-thirds of farm income; the latter account for three-quarters of farm jobs. Big farms are avidly adopting technology to cope with climate change, and to reduce their own carbon emissions. Small ones are less able to do so, and are in places where the impact of climate change is likely to be more severe.

Farming is also the main driver of deforestation, which, as well as contributing to CO_2 emissions, could affect weather patterns more directly. Each big tree in the Amazon puffs out more than 400 litres of water into the air every day, which is recycled as rain that nourishes both the forest itself and huge tracts of farmland to the south. If more than 20-25% of the original tree cover is destroyed (a fifth has gone over the past 50 years), this water cycle could break down and the rainforest might turn to savannah. That could spell catastrophe for farming across the region.

Policies can get better. Brazil recently replaced a president who abetted the slashing of the Amazon with one determined to halt it. Argentina has a chance, in October, to replace its big-farmer-bashing government with a more rational one. "The big question", says Manuel Otero of the Inter-American Institute for Cooperation on Agriculture, "is: are we in time to save the planet, or are we running behind what's happening on the ground?" ■

Religion and politics

Evangelicals may soon rival Catholics

MARABÁ AND SALVADOR

A fifth of Latin Americans are evangelical. They have increasing political clout

THE CATHEDRAL of the Universal Church of the Kingdom of God in Salvador, a city in Brazil's poor north-east, is so large that it can be seen miles away. Built in the style of a neoclassical temple, it could be a giant conference centre or a casino. On a recent Friday afternoon its annex, which can hold up to 3,000 people, was packed. Such success hints at an increasingly important force in Latin American politics.

Evangelical Christianity is the fastest-growing religion in the region. Polls on religious beliefs vary widely, but around a fifth of Latin Americans identify as evangelicals, up from a tenth in 2002. In Guatemala and Honduras, they are set to overtake Roman Catholics as the dominant religion by 2030. This could happen in Brazil by the mid-2030s, too. In the past decade, a new church has opened in Brazil almost every hour, of which 80% were evangelical.

In the 1970s enterprising pastors, inspired by those in the United States, introduced a strand known as neo-Pentecostalism. This preaches the "prosperity gospel", a radical reinterpretation of the Bible which claims that earthly wealth is a sign of divine blessings. Edir Macedo, the founder of the Universal Church, is thought to be a multimillionaire and owns the second-most-viewed TV channel in Brazil.

Such teachings proved particularly attractive to poor aspirational types who emigrated to cities. (Fully 80% of Latin Americans live in cities, up from 60% in 1975.) In Bogotá, the capital of Colombia, a mega-church runs a financial-literacy course based on biblical teachings. It uses a textbook developed by evangelicals in the United States, teaching parishioners about compound interest, how to save and how to craft a household budget.

In a region full of social-media-savvy, evangelicals have also spread their teachings online. On Instagram, an image-sharing platform, eight of the ten most-followed Christian influencers in Brazil are evangelicals, including Deive Leonardo, a 32-year-old preacher with over 13m followers (Pope Francis has 9m). "In the old days, churches used to talk about Jesus in the squares, in the streets...Today you talk about Jesus through social networks," says Pedro Franco of InChurch, a startup that provides software for churches. Nearly all of his customers are evangelicals.

All this is making evangelicalism a potent political force. Guatemala has had three evangelical presidents over the past few decades. Politicians elsewhere court the religious vote. Days before Brazil's presidential run-off in October, Luiz Inácio Lula da Silva, who won with a slim 1.8-percentage-point margin, published an open letter in which he promised not to close down churches and said he was against abortion. This was directed at the third of the electorate who are evangelical or born-again Christian. His rival Jair Bolsonaro, the incumbent, had dedicated 40% of his pre-campaign visits to activities with evangelical churches. Mr Bolsonaro's fans had also spread rumours that Lula (as he is known) was in cahoots with the devil.

Several things explain the rising religious vote. In the mid-2010s Brazil underwent a corruption probe which ensnared dozens of parties in Congress. Economic mismanagement under Dilma Rousseff, the leftist president handpicked by Lula (who was himself president from 2003 to 2010), led to a recession. In 2016 Ms Rousseff was impeached. Evangelicals promoted the idea that Brazil was going through a "moral crisis because of a lack of connection to Christian values", says Caio Barbosa of the University of São Paulo. In 2018 70% of evangelicals voted for Mr Bolsonaro, a Catholic married to an evangelical.

Mr Bolsonaro cemented the role of evangelicals in politics. He was the first president to nominate an evangelical Supreme Court judge. Churches got tax breaks. The evangelical group in the current Congress is still forming; but after the election of 2018, some 84 evangelical legislators sat in the lower house, a record.

Fears over relaxed abortion laws and "gender ideology", or more liberal views over sexuality, have increased the clout of evangelicals. Many are now forming alliances with conservative Catholics, too. This is a relatively new phenomenon. According to Taylor Boas of Boston University, in Chile's election in 2000 most evangelical leaders endorsed Ricardo Lagos, a socialist candidate, for the presidency because his rival was part of Opus Dei, a conservative Catholic lay order. But in the 2021 election, evangelicals lined up behind José Antonio Kast, a Catholic, because of his pro-life views and because he is against gay marriage. Evangelicals also recently helped elect an Opus Dei mayor in Peru.

Soul searching

This religious vote is only likely to increase in importance. José Guadalupe of the University of the Pacific in Lima, Peru, notes that across the region evangelicals are underrepresented. He reckons that in El Salvador, only 6% of deputies in Congress are evangelical, compared with more than a third of the population. In Colombia they make up 16% of the population, but have only 4% of seats in Congress.

Lula's open letter was not the first time he has cosied up to the religious right. He had a cordial relationship with Mr Macedo, whose TV channel received a growing share of government advertisements to offset the dominance of Globo, Brazil's main TV channel, which is critical of Lula. Mr Macedo supported Lula's campaign in 2002, but backed Mr Bolsonaro in 2018 and 2022.

But some evangelicals did not. Last year Mr Bolsonaro's vote share among them fell to 63%. Even as Mr Bolsonaro campaigned on gender ideology, many parishioners—who tend to be poorer, female and black—were angry about his disastrous handling of the pandemic, in which over half a million died. Politicians cannot rely on evangelicals alone for their salvation. ■

Heatwaves in India and Pakistan

At the limits of human endurance

DELHI AND JACOBABAD

Annual heatwaves on the poor and crowded Indo-Gangetic Plain are a horrific consequence of climate change

IN THE OPENING scenes of "The Ministry for the Future", the American novelist Kim Stanley Robinson imagines what happens to a small Indian town hit by a heatwave. Streets empty as normal activity becomes impossible. Air-conditioned rooms fill with silent fugitives from the heat. Rooftops are littered with the corpses of people sleeping outside in search of a non-existent breath of wind. The electricity grid, then law and order, break down. Like a medieval vision of hell, the local lake fills with half-poached bodies. Across north India, 20m die in a week.

Mr Robinson has said he wrote his bestseller, published in 2020, as a warning. The Indo-Gangetic Plain, which extends from the spine of Pakistan through northern India to the deltas of Bangladesh, is home to 700m people and exceptionally vulnerable to the heat pulses that climate change is making more frequent. It is one of the hottest, poorest and most populous places on Earth (see map on next page). Between 2000 and 2019, South Asia saw over 110,000 heat-related excess deaths a year, according to a study in *Lancet Planetary Health*, a journal. Last year's pre-monsoon hot season, which runs from March until early June, was one of the most extreme and economically disruptive on record. This year's could rival it.

India has just experienced its hottest December and February since 1901. Last month the India Meteorological Department (IMD) and its counterpart in Pakistan (PMD) warned of above-average temperatures and heatwaves until the end of May. On March 6th Narendra Modi, India's prime minister, chaired a review on hot-season preparedness. Pakistan's National Disaster Management Authority kicked off a countrywide simulation to test emergency responses to the flooding that can follow extreme heat. Despite a relatively cool March, the coming weeks could be perilously hot. On April 1st Mrutyunjay Mohapatra, IMD's chief, raised the alarm again.

Scientists record heat stress as a combination of temperature and humidity, known as a "wet-bulb" measurement. As this combined level approaches body temperature, 37°C, it becomes hard for mammals to shed heat through perspiration. At a wet-bulb temperature of around 31°C, dangerously little sweat can evaporate into the soup-like air. Brain damage and heart and kidney failure become increasingly likely. Sustained exposure to a wet-bulb temperature of 35°C, the level Mr Robinson imagines in his book, is considered fatal. The Indo-Gangetic Plain is one of the few places where such wet-bulb temperatures have been recorded, including on several occasions in the scorched Pakistani town of Jacobabad. A report by the World Bank in November warned that India could become one of the first places where wet-bulb temperatures routinely exceed the 35°C survivability threshold.

In Jacobabad, the air temperature last year peaked at 51°C. Half the town's population of 200,000 had by then fled in search of more bearable weather elsewhere. Even after the heatwave began to ease, in June, it was hard to resume regular activity. Ali Bahar, a daily-wage labourer in Jacobabad, recalls trying and failing to work in its surrounding fields in June. While driving a tractor in 42°C heat, he felt feverish and dizzy, then tumbled from the machine, injuring his head. Co-workers carried him to

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a local clinic, which dished out the standard treatment of a packet of orange-flavoured rehydration salts. He was unable to work for a week.

The temperature record provides a horrifying account of the changes afoot. According to the definition of a heatwave used by India's weather agency, India saw, on average, 23.5 heatwaves every year in the two decades to 2019, more than twice the annual average of 9.9 between 1980 and 1999. Between 2010 and 2019, the incidence of heatwaves in India grew by a quarter compared with the previous decade, with a corresponding increase in heat-related mortality of 27%. During last year's hot season, India experienced twice as many heatwave days as in the same period in 2012, the previous record year.

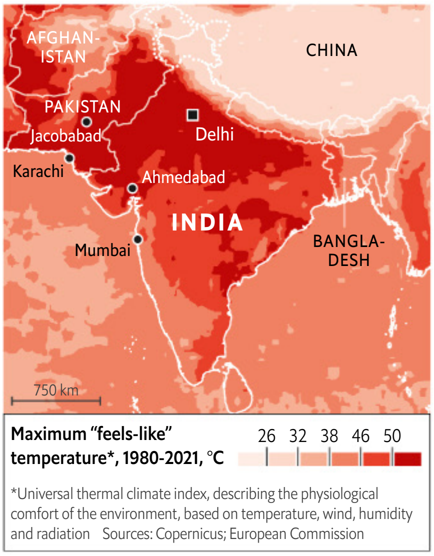
Climate change made last year's heatwave 30 times likelier than it would otherwise have been, according to World Weather Attribution, a research collaboration. That is both because it has raised India's average annual temperature—by around 0.7°C between 1900 and 2018—and because it has made heatwaves bigger and more frequent. The magnifying effect of the built urban environment, which can be 2°C hotter than nearby rural areas, is often pronounced in India's concrete jungles. Those living in slum housing, which offers little air circulation and often uses heat-sucking materials such as tin, suffer the worst of it.

Hot mess

If the climate warms by 2°C compared with pre-industrial levels, as appears unavoidable, such events would be more likely by an additional factor of 2-20. Even if the world makes more headway towards curbing greenhouse-gas emissions than looks likely, "vast regions of South Asia are projected to experience [wet-bulb temperature] episodes exceeding 31°C, which is considered extremely dangerous for most humans," according to a paper by Elfatih Eltahir of the Massachusetts Institute of Technology and colleagues.

The costs of the heat are already vast. Even working in the shade on an average summer day in Delhi results in labour losses of 15-20 minutes per hour at the hottest times, reckons Luke Parsons of Duke University, North Carolina. Mr Parsons and colleagues have estimated that India loses 101bn man-hours per year to heat, and Pakistan 13bn. During last year's hot season, the wheat harvest was down by around 15% in both countries. Livestock perished. The normal agricultural day became impossible. Electricity outages shut down industry and, worse, air-conditioning. Even India's capital, Delhi, faced blackouts.

A study in 2020 by McKinsey Global Institute (MGI), a corporate think-tank, estimates that the loss of outdoor daylight working-hours to extreme heat in India has risen from 10% of the maximum total before 1980 to 15% today. Models suggest that the proportion will double by 2050 in some parts of India.

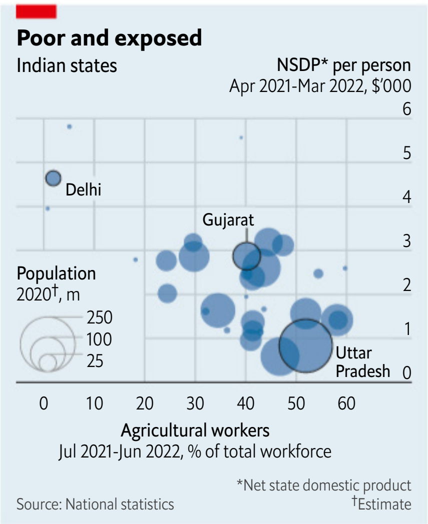


Maximum "feels-like" temperature*, 1980-2021, °C

*Universal thermal climate index, describing the physiological comfort of the environment, based on temperature, wind, humidity and radiation Sources: Copernicus; European Commission

The effect is hugely exacerbated by how labour-intensive India and other hot and poor places are (see chart). In 2017 heat-exposed work accounted for 50% of India's GDP and employed 75% of the labour force, or some 380m people. By 2030, reckons MGI, such work will still make up 40% of GDP, and the rising number of lost working hours could put at risk 2.5-4.5% of GDP, or $150bn-250bn. Pakistan could lose 6.5-9% of GDP due to climate change, the World Bank warned last year, "as increased floods and heatwaves reduce agriculture and livestock yields, destroy infrastructure, sap labour productivity and undermine health".

What, short of reversing global warming, can be done? Ahmedabad, a city in India's western state of Gujarat, offers a guide. In 2010 it suffered a heatwave that killed 800 people in a week. "This was a shocking figure," says Dileep Mavalankar.



Poor and exposed

Indian states

Source: National statistics

*Net state domestic product

†Estimate

As director of the Indian Institute of Public Health in Gandhinagar, Gujarat's capital, he helped Ahmedabad design India's first heat action plan (HAP). It recommended several simple but effective measures: warn people of extreme temperatures, advise them to stay indoors and drink lots of water, and put emergency services on alert.

Today there are estimated to be more than 100 such plans in India's cities, districts and states. Karachi, Pakistan's commercial capital, developed a similar plan after a heatwave in the city in 2015 killed 1,300 people. These steps probably contributed to a surprisingly low death toll during last year's extended heatwave. Early estimates identified only 90 deaths in India attributable to it, though the true number was probably much greater. The fact that last year's heatwave was not particularly humid was probably the main reason for the low death toll. It is also the case that places used to intense heat are better at adapting to it than ill-accustomed ones.

Some HAPS are better than others. A new study by the Centre for Policy Research, a think-tank in Delhi, found that many oversimplified heat hazards by ignoring the role of humidity, failed to target vulnerable groups and lacked adequate financing. Provisions for forecasting heatwaves are also variable. India's IMD issues a sophisticated daily heat bulletin with colour-coded five-day forecasts. Pakistan is much further behind. "The PMD is creaky in technology," says Sherry Rehman, the country's climate change minister. "To be better prepared, we will need better forecasting abilities." The two countries would do better by co-operating, says the UN.

They will both increasingly be called on to take much costlier measures, such as designing "cold shelters", rethinking urban planning and building materials, and bailing out those unable to work in the heat. "We are going to have to learn to live in a warmer world," says Gabriel Vecchi, a scientist at Princeton University, New Jersey. The question is how orderly, costly or calamitous that learning process will be.

It is hard to find much comfort in the underlying facts. Year by year, parts of the poor and crowded Indo-Gangetic Plain will become increasingly unlivable for days or weeks on end. Even the most capable government would struggle to prevent that leading to catastrophe. And India's, much less Pakistan's, is not the most capable.

This is in fact where Mr Robinson's dystopian novel goes off the rails. He imagines the heatwave he describes spurring transformative climate action around the world. That was "ludicrously unrealistic", concluded Francis Fukuyama, a political scientist. Yet without such action, it is hard to see what will stop one of the most dire threats of global warming becoming a horrifying reality. ■

The Indian Premier League

Hit for six

India's lucrative domestic tournament is strangling international contests

The growth of the Indian Premier League (IPL) has been spectacular. Only 15 years after its launch, India's biggest domestic cricket contest, which this year began its annual rendition on March 31st, has become by one measure the world's second-most lucrative sports league after America's National Football League (NFL). The sale of five-year media rights to the IPL, which uses the fast-paced Twenty20 (T20) cricket format, raised $6.2bn last year for its organiser, the Board of Control for Cricket in India. This commercial success has confirmed India as by far the dominant economic power in cricket. But the owners of the IPL's team franchises, who include some of India's richest men and biggest companies, want more.

The valuations of IPL franchises are much less than the billions that English football clubs and American football teams can trade for. Two new IPL teams were sold in 2021 for $940m and $750m. This mostly reflects how little cricket they play. The IPL season consists of 74 matches played over two months. The NFL hosts 272 games a year. To expand their playing time, India's franchise owners are looking abroad.

In the past year IPL owners have snapped up all six franchises in SA20, a new T20 league in South Africa; three of the six teams in the United Arab Emirates' International League; and four of the six sides in Major League Cricket, a new American competition that begins in July. These acquisitions have turned the IPL owners into international businesses. For example, the stable of the Mumbai Indians team, which is owned by a subsidiary of Reliance, India's biggest industrial group, consists of five teams in four countries.

Reliance and other multi-team T20 investors hope to mobilise their Indian fans behind their newer acquisitions. That should greatly increase merchandise, broadcast and other revenues. The overseas teams are expected to act as feeder clubs for the IPL, says Dan Weston of Sports Analytics Advantage, which helps the franchises build their rosters for T20 tournaments. The Mumbai Indians signed up a promising South African bowler, Duan Jansen, for their Cape Town team and, encouraged by his performances, brought him to Mumbai. Owning teams abroad also helps IPL investors experiment tactically. Before Sunrisers Hyderabad appointed their captain for 2023, they gave him a trial leading their Eastern Cape side.

At crease increase

For the new leagues, the IPL connection confers credibility as well as financial clout. According to Graeme Smith, a former South African captain and now the commissioner of SA20, "the willingness of IPL owners to share their experience and know-how was key to our success in season one." Although the South African league does not disclose its finances, IPL owners are believed to have paid more than $25m each for at least two of the teams and, more important, generated enough interest back in India for its media rights to have been sold there. This made sure its first season was profitable.

For cricket fans, the changes are dizzying—and not entirely positive. The game has long been largely organised around international contests. The domestic tournaments played in Australia, England, India, South Africa and other cricketing powers were mainly considered as talent pools for the national teams. The privatisation of cricket through the IPL's franchise model, and its huge commercial success, has upended that relationship. IPL owners can offer players far bigger salaries than their national cricket boards. So more and more cricketers are cutting short international careers in favour of the T20 circuit.

The fear is that younger cricket stars will forgo international cricket altogether. The IPL's de facto global expansion makes that much likelier. Venky Mysore, chief executive of the Kolkata Knight Riders franchise (which also owns teams in three other leagues), wants to sign players on year-round contracts to play for all his sides. That would be incompatible with the national service that former star players such as Mr Smith, who played 347 times for South Africa, describe as the highlight of their careers. ■

Electronic music

The sonic outernationalist

Sakamoto Ryuichi heard how the world sounds—and changed it

Sakamoto Ryuichi, who died on March 28th after a long battle with cancer, once described his musical method thus: "I open my ears to the world." But what Mr Sakamoto heard, few others could. As a member of the Japanese techno-pop band Yellow Magic Orchestra, he helped pioneer modern electronic music. As a composer of epic film scores he enlivened the work of directors such as Bernardo Bertolucci and Alejandro Iñárritu. In his later solo work, he grappled with mortality in haunting ambient soundscapes. His passing elicited tributes from musical luminaries around the world, testimony to the influence of his genre-spanning career.

Mr Sakamoto was born in Tokyo in 1952 and took to music early. He graduated from one of Tokyo's top conservatories, where he studied Western classical music, becoming especially enamoured with Claude Debussy. There, he also explored an interest in the traditional music of Japan's Okinawa prefecture as well as in that of India and Africa.

Early in his career, Mr Sakamoto trained his ears on the sound of technology. Yellow Magic Orchestra (YMO), a group he formed in 1978 alongside Hosono Haruomi and Takahashi Yukihiro, used synthesisers in instrumental songs intended for dancing—a novel combination at the time. "Errors or noises absorb me and I wonder if new cultural currents could emerge from this deficiency," Mr Sakamoto said in "Tokyo Melody", a 1984 documentary about his experiments. That was exactly what happened: Mr Sakamoto's music helped inspire what would later become techno and hip-hop. His early work also presaged the bleeps and boops that became the soundscape of the modern digital world. (He would take a turn at composing some of those too, including ringtones for early Nokia mobile phones.)

YMO's success made Mr Sakamoto a star in Japan, leading to a role opposite David Bowie in Oshima Nagisa's 1983 film "Merry Christmas, Mr Lawrence". Mr Sakamoto agreed to act in the movie on the condition that he could score it. His compositions, which blended melodic piano chords, sweeping synthesisers and Javanese gamelan, propelled him to global fame—and established his bona fides as an artist who could bridge east and west.

"I want to break down the walls between genres, categories or cultures," he

▸▸

said many years later. He described his philosophy as "outernationalism". "Being outernational is like Moses in the desert. There's no country."

In the second half of his career he turned towards the sound of nature. "He listened to the wind blowing and the water falling, he listened to the rocks moving and to the leaves fluttering, and he introduced those sounds—consciously and subconsciously—into his music," says Roger Pulvers, an author and film director.

His sonic interests dovetailed with his politics. Unusually for a Japanese musician, Mr Sakamoto used his fame to speak out on social and political issues, including environmental preservation and the oppression of Okinawans. Nuclear power was a particular bugbear. "They know nuclear power is unnecessary and dangerous," he railed in an interview in 2006, five years before an earthquake and tsunami rocked north-east Japan and triggered a nuclear meltdown in Fukushima. In the wake of the disaster, Mr Sakamoto travelled often to the region to support local residents.

In 2014 a first cancer diagnosis shook Mr Sakamoto's life. But even that could not mute his longing to hear more. The next year he composed the score for Mr Iñárritu's "The Revenant". Two years later he released "async", an ambient album constructed around collages of poetry and music that was recorded partly on a water-damaged piano he found in a schoolhouse after the tsunami. In "Coda", a documentary about Mr Sakamoto released the same year, he can be seen traversing the North Pole and dropping microphones underneath the ice. "I'm fishing the sound," he says, grinning at the camera, before declaring his catch "the purest I've ever heard". ■

Banyan Bad blood on the tracks

China's huge Asian investments provoke as much resentment as gratitude

Another triumph for the Belt and Road Initiative (BRI)! That part of the Chinese media aimed at readers abroad made much of the news that late last month a Chinese company had completed laying the track for a high-speed railway between Jakarta and Bandung in Indonesia. The railway, for which China won a contract in 2015, is what its media call an "exemplary" project. Criticism of it is dismissed as "Western slander", of the sort that has dogged the BRI as a whole. But in fact the railway illustrates the suspicion and resentment that Chinese projects often face in the countries where they are built.

The BRI was launched a decade ago to pour Chinese investment into building infrastructure linking Asia and Europe. It has since expanded to cover the whole world and some 150 countries from Somalia to Poland. Last month Jim Yong Kim, a former president of the World Bank, called it the "most ambitious development project in human history". Before the BRI, Chinese investments in other Asian countries were sniped at for all manner of alleged sins, including fostering corruption, environmental vandalism and distorting national politics. The BRI was meant in part to demonstrate China's essential benevolence. In that respect, it has not worked.

The annual Boao Forum for Asia, a kind of Davos for China's backyard held in the country's south at the end of March, was this year partly devoted to celebrating ten years of the BRI and, in a favourite phrase of China's leaders, its "win-win" character. But China's growing economic influence is still far from universally welcomed—in part because of, rather than in spite of, the boom in Chinese-led investment projects.

The 142km Jakarta-Bandung line—which should cut the journey from three hours to 40 minutes, and ease Jakarta's appalling congestion—illustrates some of the criticisms. One is that although China offers what look like easier financial terms and has a reputation for efficient execution, its projects are as prone as any to delays and problems. In this case, the first feasibility study was done by Japanese companies. But Japan demanded a government guarantee for 50% of the financing. A rival Chinese proposal required no guarantee, and seemed cheaper. Yet when it opens in July it will be several hundred million dollars over budget and four years behind schedule, because of pandemic-related, land-acquisition and other delays and environmental controversies.

The project is 60% owned by Indonesian government companies, and was initially financed by a $4.5bn loan from the state-owned China Development Bank. This loan is on highly concessional terms (an interest rate of 2% and a 40-year repayment period), so China takes umbrage at allegations that it is part of a "debt-trap" strategy. Indeed, China's critics do seem to want to have it both ways—castigating it for enmeshing its partners in a net of unsustainable debt, and then seizing gleefully on reports that between 2000 and 2021, China spent $240bn bailing out 22 countries, with almost all of it going to those that are host to BRI projects. Yet China has sometimes proved obstructive when it comes to international sovereign debt-relief efforts, denting its image.

Another oft-cited example of China's "debt-trap diplomacy" is the Chinese-built and -financed port in Hambantota, in southern Sri Lanka. The port opened in 2010, but the government soon found itself in dire financial straits and asked China to take over, which in 2017 a Chinese firm duly did, on a 99-year lease.

The takeover enraged Sri Lankans and was a blow to national self-esteem, but the debt-trap accusations seem unfair. The episode, however, illustrates another feature of Chinese projects that causes local resentment: that they seem to favour incumbent rulers. In was widely seen in Sri Lanka as one of many vanity projects promoted by Mahinda Rajapaksa, then the president. The port was an issue in the 2015 presidential election, which Mr Rajapaksa lost.

The perception that China abuses its economic muscle is widespread across South-East Asia. An annual survey of more than 1,300 officials, academics, businesspeople and other opinion-formers across the region, published in February by the ASEAN Studies Centre at the ISEAS-Yusof Ishak Institute, a think-tank in Singapore, found that nearly 70% of those who see China as the region's most influential strategic power view its growing influence with concern. China's win-win economic diplomacy seems to need all the good publicity it can get.

Taiwan's pro-China islands

In the dragon's mouth

KINMEN

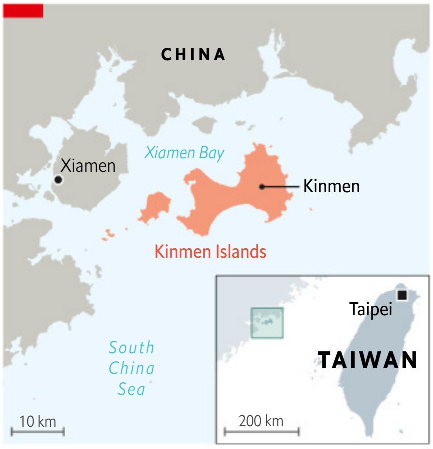
A visit to Kinmen, a Taiwanese island 3km from the Chinese mainland

THINK ABOUT it this way: if in a conflict between America and China it is Taiwan that will be the front line, then in a confrontation between Taiwan and China that role will be played by Kinmen, an island that is 187km from Taiwan, which administers it, but only 3km away from China, which does not.

Kinmen, just 150 sq km, is the main island in an archipelagic Taiwanese county of 142,000 residents at the mouth of Xiamen Bay, nestling up against Fujian province in southern China (see map). Rusting anti-ship barricades line its beaches. The skyline of Xiamen, a sub-provincial but by comparison massive Chinese city just across the water, is visible from its shores. In 2001 a ferry started operating to Xiamen, turning the island into a centre of tourism and business exchange. Many in Kinmen would like to be closer still—some have proposed a bridge and want the electricity grids to be connected. They hope not just to make Kinmen more prosperous, but also that closer integration with the mainland might be the best way to avoid being attacked. "America, China, Taiwan, whatever you do, just leave us out of it," says Chen Yang-hue, a local councillor. He is one of several local politicians to demand, in February, that Taiwan withdraw its troops and "demilitarise" the island. Taiwan's central government has not issued a response.

The Kinmen islands were cut off from the Chinese mainland in 1949, when they turned into the front line of China's civil war between the Nationalists, who escaped to Taiwan and became the self-governing entity known as the Republic of China, and the Communists, who won control of the mainland and created the People's Republic of China.

For decades, Kinmen endured routine shelling from China even as Taiwan turned the county into a garrison, with as many as 100,000 soldiers stationed there. Kinmenese were forced to carry supplies for the soldiers, to live under curfew and to train in village fighting units from the age of 16. Hong Ming-hwa, 88, was a dock worker when China subjected Kinmen to a burst of shelling in 1958, firing more than 470,000 shells in 44 days. More than 600 people died. He remembers soldiers fleeing while he and other locals waded past dead bodies in the water to save as many people as they could. "If there was no Kinmen then, there would be no Taiwan now," he says.



Many Kinmenese feel that Taiwan owes them a debt of peace. Its pro-China politicians complain that Taiwan's politics are blocking Kinmen from prosperity, and that they have been left behind while mainland China and the rest of Taiwan prosper. That is an illusion: Kinmen's average disposable income per person in 2021 was roughly $13,200, compared with $21,800 in Taipei, Taiwan's capital, and $9,980 in Xiamen.

But the contrast between the dozy villages of Kinmen and the high-rises of Xiamen still gives rise to envy. Kinmenese want to be part of China's growth and China wants to invest, says Chen Yu-Jen, who represents Kinmen in the national parliament: "They will treat us well, make us a model, and Kinmen can develop and prosper. But Taiwan won't accept this."

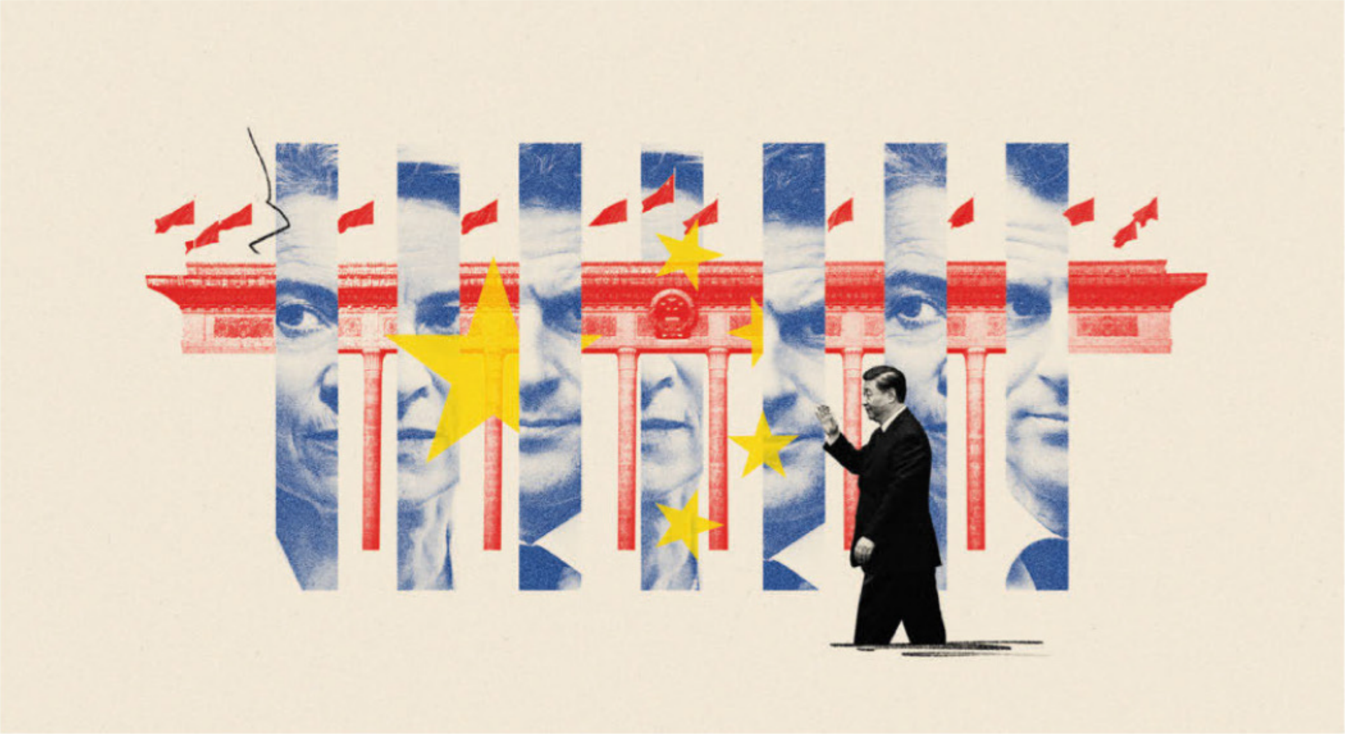
Supporters of demilitarisation also blame Taiwan, not China, for threatening Kinmen's safety. China does not want to attack Kinmen in the first place because they are family, argues Mr Chen, the councillor. But the 3,000 Taiwanese soldiers stationed on Kinmen are a "thorn" in China's side that should be removed, he says. "If we pose no threat, they won't hurt us," he says.

The arguments strike some as naive. Kinmenese are not discussing whether peace through integration with China would mean a loss of freedoms, says Wang Ling, 37. Ms Wang grew up in Kinmen and went to university in Taipei. She used to argue with her Taiwanese classmates, insisting that she was Chinese because of Kinmen's Fujianese heritage. Kinmenese speak the same southern Fujianese dialect as people in Xiamen. Many still live in traditional Fujianese homes with curving red roofs. But gradually she realised her affinity to China was cultural, not political. In Taipei she joined labour-rights campaigns. Later, she studied in Beijing, where she saw how grassroots activists were suppressed. Now she calls herself Taiwanese. Already Kinmenese politicians act "like obedient children", not equals, when they interact with Chinese officials, she says.

And just because Kinmen says "no war" does not mean that it will not happen, says Tung Sen-po, a county councillor who opposes the demilitarisation plan as unrealistic. Instead Kinmen—and Taiwan—should prepare for the worst while holding on to their democratic values, he says. That is a tough message for a people who feel they have little control over their own future. "We are the pawns, the chess pieces," says Mr Tung, "not the chess players." ■

Outlier island

China



Europe and China

Mixed messaging

A European consensus on how to handle China is hard to maintain

EMMANUEL MACRON, France's president, had hoped that his visit to China this week would demonstrate European unity and support for his efforts to re-engage with the world's second-largest economy. To underline the point, he invited Ursula von der Leyen, the president of the European Commission, to join him on the visit from April 5th to 7th. The pair would speak with "a unified voice", Mr Macron said.

The joint visit may instead highlight tension in Europe over how to handle China, given its escalating confrontation with America and support for Russia during the war in Ukraine. Across much of the continent, public attitudes towards China have hardened and policy is stiffening too, in part because of American pressure.

And yet many European governments and firms are keen to rebuild economic relations with China as it emerges from three years of isolation caused by its draconian curbs on covid-19. They also remain deeply wary of American efforts to contain China militarily and technologically.

Mr Macron, making his first visit to China since 2019, and Mrs von der Leyen, on her inaugural trip there in her current role, will still stage a show of unity during trilateral meetings in Beijing on April 6th. In particular, they are expected to urge Mr Xi to make clear that China will not supply lethal weapons to Russia, and push him to do more to try to end the war in Ukraine.

In a show of Western cohesion on the eve of his departure, Mr Macron spoke to America's president, Joe Biden. The two expressed a "common desire to engage China and accelerate an end to the war in Ukraine". Mrs von der Leyen, meanwhile, talked to Ukraine's president, Volodymyr Zelensky. She said the EU wanted "a just peace that respects Ukraine's sovereignty and territorial integrity."

In Beijing, Mr Macron and Mrs von der Leyen may echo Western calls for restraint over Taiwan, a self-governing island that China claims. Its president, Tsai Ing-wen, was due to meet the speaker of America's House of Representatives, Kevin McCarthy, in Los Angeles on April 5th. China has threatened "resolute countermeasures". It has not elaborated, but when the previous speaker, Nancy Pelosi, visited Taiwan in August, China fired missiles over the island and simulated a blockade.

As the European leaders' visit progresses, however, their differences on China will become more apparent. Mr Macron will accompany Mr Xi on a visit to southern China where Mr Xi's father pioneered market-opening reforms. Mr Macron is travelling with 53 French executives. Lots of business deals are expected. Mr Macron is no China dove. But he wants "strategic autonomy" for Europe, and France to be a "balancing power". Unlike many American politicians, he does not seek to isolate or contain China. He sees it as a possible "game-changer" on Ukraine.

Mrs von der Leyen, by contrast, has already upset Chinese officials by laying out a more confrontational approach. In a speech on March 30th, she said Europe wanted to "de-risk" rather than "decouple" its relations with China. But she called for tighter controls on Europe's technology trade with China. She also voiced scepticism about China's peace plan for Ukraine, proposed in February. She said China's stance on the war would be a "determining factor" in its ties with the EU.

Some EU member-states consider Mrs von der Leyen too close to the Biden administration. But her speech reflected a change in attitudes towards China across

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much of Europe. That began before the war in Ukraine, as concern mounted over issues involving trade as well as China's political influence and espionage operations.

In 2019 the European Commission declared China a "systemic rival". A shift towards viewing China warily has since accelerated, especially in eastern and central European countries where China has failed to deliver promised economic benefits. Most are now aligning closely with America as a result of the war in Ukraine.

China seemed taken aback by the tone of Mrs von der Leyen's speech. It "contained a lot of misrepresentation and misinterpretation of Chinese policies," said Fu Cong, China's ambassador to the EU. A letdown for China was her suggestion that the EU's Comprehensive Agreement on Investment (CAI) with China should be reassessed. That deal was reached in 2020 but was shelved after China imposed sanctions on European entities and politicians in response to EU sanctions on Chinese officials involved in abusing human rights in Xinjiang. Chinese diplomats have recently suggested a simultaneous lifting of sanctions to revive the CAI.

The speech may have complicated Mr Macron's plans. He had hoped to show the kind of unity that he engineered when Mr Xi went to Paris in 2019, when he made sure that German and EU leaders were there to join him. Last autumn Mr Macron wanted to make a joint trip to China with Olaf Scholz, Germany's current chancellor. But Mr Scholz insisted on going alone.

In theory, Mrs von der Leyen's speech could still work to Mr Macron's advantage by shifting public focus away from his efforts to revive commercial ties and by encouraging Mr Xi to make his visit a success. China increasingly sees Mr Macron as its main advocate within Europe, as Germany, its biggest economic partner, is consumed by a political debate over its China strategy.

At the same time, with protests over his pension reforms continuing at home, Mr Macron faces more pressure to secure a meaningful Chinese commitment on Ukraine. It would need to go beyond a simple expression of opposition to nuclear threats or attacks, as Mr Xi conveyed to Mr Scholz.

One possibility is for Mr Xi to make a personal pledge, similar to ones already given by some Chinese officials, to refrain from arming Russia. Another option is that Mr Xi schedules virtual talks with Mr Zelensky. Some foreign officials had expected those to happen soon after Mr Xi visited Moscow in March.

Still, Mr Xi will avoid saying anything that undermines his relationship with Russia's president, Vladimir Putin. When Spain's prime minister, Pedro Sánchez, visited Beijing on March 30th and 31st, he urged Mr Xi to speak to Mr Zelensky and recommended the Ukrainian leader's peace plan, which calls for the restoration his country's pre-2014 borders. But there was no public response from China.

If Mr Xi does give some ground on Ukraine, Mr Macron's visit may well embolden Europeans who favour economic re-engagement with China and worry about getting too close to America—especially if Donald Trump wins the presidential election in 2024. It would not reverse the trend towards a tougher stance on China in Europe but it could limit the speed and scope of the change. It could also complicate Mr Biden's efforts to keep Europe on board if, as expected, he further tightens restrictions on technology trade with China.

If Mr Macron fails to extract at least a rhetorical Chinese concession on Ukraine, he may weaken the case for closer economic ties with China. He could also face more of the criticism that followed his failed efforts to talk Mr Putin out of going to war. Mr Xi will no doubt exploit any French signals about a willingness to re-engage economically, says Noah Barkin of Rhodium Group, a research firm. "The question is: will Macron be offering something without getting anything in return?" ■

China and Taiwan

We are all Chinese

TAIPEI

In China, Taiwan's ex-president, Ma Ying-jeou, treads a linguistic minefield

If only the Taiwanese were behind me

On both sides of the Taiwan Strait this week, people have been observing the Qingming festival by sweeping the tombs of their ancestors. Many Taiwanese think it only natural that Ma Ying-jeou, their former president, used a trip to the mainland to visit his grandfather's tomb in Hunan province for such a ceremony. But many object to the way that Mr Ma has also been waxing lyrical about the shared ancestry of Taiwanese and mainlanders. In Taiwan, supporters of the ruling Democratic Progressive Party (his own party is the Kuomintang or KMT) say his words smack of support for unification.

The mainland and Taiwan share a "common inheritance of blood, language, history and culture", Mr Ma told Song Tao, China's head of Taiwan affairs, during his unprecedented 12-day trip which ends on April 7th. He has also said that people on both sides of the strait are "descendants of the Yan and Huang emperors", the mythical ancestors of ethnic-Han people, who form more than 90% of China's population, and of Taiwan's.

Most Taiwanese are descendants of people who migrated from the mainland over the past few hundred years, and who have retained many features of their ancestral culture. But such matters touch on highly sensitive politics. China stresses the importance of these ethnic bonds: in its view, they reinforce its claim to the island. Many Taiwanese prefer to emphasise what makes them different.

One of Mr Ma's ethnic terms has drawn particular attention back home: *Zhonghua minzu*. It can mean "Chinese ethnicities" (including everyone from Uyghurs to Han), or "Chinese nation" in the sense of a culturally bound people. Mr Ma called on the mainland and Taiwan to work together to "revitalise the *Zhonghua minzu*". He said people on both sides of the strait were members of this group.

He was drawing on terminology used by Sun Yat-sen, who was the first president of the Republic of China—now exiled to Taiwan—after its founding in 1912 (Mr Ma is pictured in Nanjing, paying homage to him). Mr Sun's aim then was to form a single Chinese race, "melding" other ethnic groups with the dominant Han. The term today is much loved by China's president, Xi Jinping, who talks of his mission to secure the "great rejuvenation of the *Zhonghua minzu*". Increasingly, that is looking like an effort to step up Han dominance.

The gap between Chinese and Taiwanese understandings of such terms is one reason why Taiwanese increasingly reject identity with the mainland. The KMT's authoritarian past is another. Having fled to Taiwan, the party suppressed local languages, purged dissidents and made people call themselves *Zhongguoren*, or Chinese. To the KMT, the term implied membership of a political state encompassing Taiwan as well as mainland China, with all of that territory notionally under KMT rule. To the Communist Party it means the same, only with the Communists in charge.

Since then, the term *Zhongguoren* has become so much more associated with ▸▸

Communist China that just 2.7% of Taiwanese identify only as *Zhongguoren*, versus 61% as Taiwanese and 33% as both, according to polls by National Chengchi University. That is a radical change from 1992, when such polling started. Back then, far more identified as *Zhongguoren* and far fewer as Taiwanese. Democratisation allowed suppressed local cultures to emerge. It also let Taiwanese rethink their history and relationship with the state. "Here, the state's role is to protect human rights. But over there, it is to pursue racial glory," Joyce Yen, a Taiwanese writer, has observed.

Taiwanese still embrace much of Chinese culture. But they worry that strands of it, evident over millennia, may foster authoritarianism. Taiwan's concept of *Zhonghua minzu* has already diverged from that in the mainland, said Ms Yen in 2019. Many Taiwanese no longer see their ancestral culture as a basis for claiming membership of a nation. In Taiwan, Mr Ma's ethnic references sound anachronistic. He is asserting an outdated vision of a unified China based on *minzu,* or ethnicity. The Taiwanese have already moved on to embrace *minzhu,* or democracy. ■

Scholarly decoupling

Great academic walls

BEIJING

Studying China is getting much harder

For much of the past century, foreign academics have had a tough time learning about China. Few could visit the country when it was ruled by Mao Zedong. Some instead tracked newspapers like the *People's Daily*, a Communist Party mouthpiece. These offered plenty of ideological hectoring but few believable details about people's lives. Reading dry party documents, an art known as Pekingology, was like "swallowing sawdust by the bucketful", as one renowned China-watcher put it.

Some Western scholars went to meet refugees in Hong Kong, which was then under British rule. Interviewees often assumed that the researchers were spies (some probably were). One academic recalled his struggles trying to find out about the legal system under Mao. His informant in Hong Kong kept trying to tell him where China's airfields were hidden.

Things got easier after Deng Xiaoping took over in the late 1970s. Understanding of China's society, economy, government and history grew rapidly as archives were opened up to foreigners and Western scholars were given freedom to interview officials, spend time in villages and read the growing volume of Chinese-language scholarship, much of which was eventually put online. Thousands of foreign students went to China to study.

This encouraging trend has reversed in recent years. As relations sour with the West, China is becoming increasingly opaque to foreign scholars. Even before covid-19, local officials were making it harder to do field work in the Chinese countryside. "Some of the best studies from the early 2010s could not be done now," says Rana Mitter, a professor of Chinese history at the University of Oxford. Government archives, too, are often now hard for foreign researchers to access, he adds.

Three years of border closures to prevent covid's spread did not help. Research projects were paused. Future scholarship was also derailed as young foreigners became unable to study in China and thereby gain crucial language skills. A decade ago, there were nearly 15,000 American students studying in China. In the academic year of 2020-2021 there were 382. Covid restrictions are now over. Student numbers will rebound somewhat. But few expect them to return to the scale of the old days.

Chinese universities, too, are becoming less keen for their faculty to co-operate with foreign academics. In 2021 Jia Qingguo, an international-relations professor at Peking University, complained that scholars needed permission just to meet a foreigner, could not see them alone and had to file a report afterwards. Party officials talk about turning the university into a patriotic academy "with Chinese characteristics", unmoored to ideologically suspect Western scholarship.

The fault is not all China's. America, fearing spies, has made it harder for Chinese scholars to visit, too. In 2018 some 20,000 Chinese were granted research visas. In 2022 fewer than 4,000 were.

With their access dwindling, foreign scholars have come to rely more on online databases. But these are increasingly unreliable. An online portal called China National Knowledge Infrastructure (CNKI) contains some 95% of Chinese academic articles as well as a host of other documents. On April 1st CNKI suspended foreign access to some of its databases. The firm said it was complying with laws requiring large data transfers out of China to be reviewed by cyberspace regulators.

The academic journals on CNKI, like all publicly available content in China, are heavily censored. But they can still contain important nuggets, says David Cowhig, a retired American diplomat. Before 2005 China officially denied that a certain strain of bird flu had infected humans on the mainland. At the same time, however, studies in veterinary journals, which Mr Cowhig found through scrutinising CNKI, casually mentioned that several farmers had been found with antibodies to the virus, he recalls.

Other online resources relied on by scholars are shrinking, too. China Judgments Online, a database of legal cases, opened in 2013. At the time it was an unprecedented window onto how justice works in China. In the past two years millions of cases have vanished from its archive. The disappeared ones appear to touch on topics potentially embarrassing to the party, like death-penalty verdicts.

Faced with these challenges, some China watchers are returning to methods of the cold-war era. A research institute called the Centre for Strategic Translation was set up in America last year by the American Governance Foundation, an NGO. Its stated aim is to help scholars and others by translating and explaining official Chinese documents. "China darkens as it climbs in power," notes the website. When access to China is shrinking, the old arts of Pekingology can still help shed some light, argue the centre's proponents. Back to swallowing sawdust. ■

In Mao's day, these made excellent sawdust

Chaguan | Xi Jinping is not another Mao

A strongman who wants to harness, not blow up, China's deep state

Each time President Xi Jinping grabs more powers, critics compare China's leader to Chairman Mao Zedong, whose one-man rule led the country to disaster. Those grumblers may underestimate Mr Xi's ambitions. Rather often, the charge that Mr Xi is emulating Mao—a despot whose campaigns of political terror and deranged economic policies left tens of millions dead—is a prediction that China's leader is storing up trouble for himself, by weakening norms and institutions that might helpfully check and balance his authority. Such doomsayers are drawing lessons from Mao's unhappy end. Over the two decades before his death in 1976, absolute power and a cult of personality left the Great Helmsman increasingly isolated and paranoid: a tyrant alienated from his most capable revolutionary comrades, military commanders and aides, many of whom were purged or driven to their deaths.

In Mr Xi's case, those predicting doom tot up the numerous enemies he has made in his first decade as the Communist Party's boss. They note persistent anti-corruption campaigns that have ensnared hundreds of thousands of officials, including the heads of giant state-owned firms, police and other security chiefs, army generals and members of the party's ruling Politburo. The same doubters point to Xi-era regulatory clampdowns and policy changes that have left China's business sector in a funk and driven billionaires, entrepreneurs, creative artists and other useful talents to flee the country. To all this, bearish sorts would add last December's abrupt, fatally ill-planned abandonment of covid-19 controls. Elites in cities like Beijing, ever alive to changing political winds, shudder when they hear Mao-era slogans revived. They wince when officials call Mr Xi the "party core" and "people's leader", or urge all 97m party members to study Xi Jinping Thought.

An announcement last month set nerves jangling. Officials unveiled a party-wide plan for "promoting investigation and research", which will see officials sent to "grassroots units", down to individual businesses, schools or villages. Once on the ground, officials are to listen to the masses and contemplate whether, in their own work, they have drifted into "formalism", party jargon for only pretending to heed Mr Xi's instructions. To educated Chinese, the echoes are loud of an earlier campaign to promote investigation and research, launched in 1960-61 as senior leaders were sent to their home towns to investigate "errors" in the Great Leap Forward, Mao's calamitous movement to collectivise farming and industry, which killed millions in a man-made famine.

In 1961 Mao had lost the trust of many senior colleagues. Sending some of them on investigation tours gave him political cover to reverse the worst policies of his Great Leap Forward. Soon, though, he was bent on revenge. In 1966 he mobilised the masses to attack and overthrow party officials and other authority figures. China calls that frenzied, bloody decade the Cultural Revolution. Modern Americans might term it Mao's "campaign against the deep state", says Professor Andrew Walder of Stanford University.

The analogy is helpful for outsiders pondering Mr Xi's approach to power. To call Mr Xi a second Mao is misleading. Mao was a radical, willing to blow up an establishment he distrusted. Scornful of the notion that internal party discipline could reform arrogant bureaucrats, he chose to chasten cadres with violent class struggle, imposed from below by the mob. In contrast, Mr Xi is a career politician who calls on party members to self-purify, under the supervision of fearsome internal-discipline inspectors. He believes in top-down control, not chaos. He has worked to extend his party's reach into every corner of the economy and society. He has built a vast apparatus of censorship, surveillance and propaganda to control the masses, not to unleash them. Put another way, Mr Xi wants to be more than a Mao-style strongman. He also wants to wield power through the deep state.

For evidence, consider Mr Xi's praise for Liu Shaoqi, China's one-time president and a man whom Mao came to loathe as, in Professor Walder's words, "the head of the deep state". Liu was a hardline, Moscow-trained organiser of underground party cells and guerrilla units before the revolution, and a ruthless enforcer of party discipline after it. He fell out with Mao as the Great Leap Forward's disasters became undeniable. Liu confronted his leader behind closed doors after meeting starving farmers in his home region in the central province of Hunan in 1961. For his pains, Liu was purged and tormented during the Cultural Revolution, and rehabilitated only after Mao's death.

Personalised rule or a strong party? Xi's answer: both

Liu's tour of Hunan is commemorated today in the village of Tianhua. Old photographs in an exhibition hall show him coaxing the truth from nervous farmers. A mud-walled farm office where he stayed has been restored. Yang Yi, the curator, shows a door resting on two benches which the then-president of China supposedly used as his bed, after arriving undercover as a simple inspector (a lorry that arrived with soft furnishings was shooed away). Mr Xi mentioned the same hard bed in a speech in 2018 that hailed Liu as a shining example of a party cadre seeking "truth through facts". That phrase adorns the entrance to the site, which drew 300,000 officials, schoolchildren, soldiers and other visitors in the last year before covid-19. The Tianhua exhibition twists history to portray Mao and Liu as allies, jointly investigating the masses' suffering. Asked about Liu's lonely death in a detention site in 1969, Mr Yang blames not Mao but his acolytes known as the Gang of Four.

Such claims of unity are bad history, but politically revealing. As Professor Walder notes, Mr Xi uses Maoist symbols, but in his obsession with discipline, grassroots party-building, and with officials being tempered by hardship, he sounds like Liu. Xi-style governance combines one-man rule with nominally strong party institutions. A big test involves truth-telling. Can underlings inform Mr Xi when he is wrong? If not, disasters surely await. ■

Hitting the books

Useless studies

Crunching the puny financial benefits of many university courses

Is university worth it? That question once seemed a no-brainer. For decades young adults in rich countries have flocked to higher education. Governments have touted college as a boon for social mobility and economic growth. Yet as fees rise and graduate earnings stagnate, disillusionment is growing. A poll published by the *Wall Street Journal* on March 31st suggests a crisis of confidence has worsened: 56% of Americans now believe a degree is no longer worth the time and money spent on it.

For an average undergraduate, at least, this is not consistent with the facts. In most places, for most learners, the financial returns to higher education remain extremely healthy. Yet undertaking a degree has become riskier. The rewards for the best performers are increasing, but a troublingly high share of students see negative returns from their studies.

New data sets, such as tax records, are illuminating this dispersion like never before. They can track how much students taking specific courses, at specific institutions, earn in later life. In time that detail will help students avoid the worst pay-offs and seize the best. Choice of subject and timely graduation matter hugely; choice of institution somewhat less so. It could also be useful to governments tempted to crack down on "low-value degrees".

A boom in graduate earnings began in the 1980s in the rich world. Back then the difference between the salaries of people who gain at least a bachelor's degree and those who do not—commonly called the "college-wage premium"—began to soar. In the 1970s an American with a university education was earning on average 35% more than a high-school graduate. By 2021 that advantage had risen to 66%.

Recently the wage premium in many countries has either stagnated or begun to fall. And in places that actually charge students for their degrees, costs have gone up. Tuition in England has soared from nothing in the late 1990s to £9,250 ($11,000) a year, the highest in the rich world. In America, the out-of-pocket fee paid by an average bachelor's-degree student increased from $2,300 a year in the 1970s to some $8,000 in 2018, in real terms, according to Jaison Abel and Richard Deitz at the New York Federal Reserve. (Students at public universities often pay less; those at private non-profits can pay a lot more.)

Yet the average degree remains valuable. In 2019 Mr Abel and Mr Deitz estimated the annual financial return on the money that a typical American invests in a bachelor's degree. They conclude that the typical rate of return for a bachelor's degree is around 14%. That has dropped from a peak of 16% in the early 2000s. But it is still high. And it is well above the 8-9% that American graduates were recouping in the 1970s, before graduate wages, and tuition fees, began to soar. These calculations include not only fees but also the money individuals might expect to earn if they were working full-time instead.

The average hides a very wide range of outcomes, however. Until recently economists seeking to identify the winners and losers were mostly limited to surveys. The trend now is for governments, such as those of Britain and Norway, to proffer hefty, anonymised databases showing actual earnings for millions of university-goers. That makes it much easier to compare people like-for-like. The disaggregated data reveal that a high share of students graduate with degrees that are not worth their cost.

In England 25% of male graduates and 15% of female ones will earn less money over their careers than peers who do not get a degree, according to the Institute for Fiscal Studies (IFS), a research outfit. America has less comprehensive data but has begun publishing the share of students at thousands of institutions who do not manage to earn more than the average high-school graduate early on. Six years after enrolling, 27% of students at a typical four-year university fail to do so, find researchers at Georgetown University in Washington, DC. In the long tail, comprising the worst 30% of America's two- and four-year institutions, more than half of people who enroll lag this benchmark.

Dropping out without any qualification is an obvious way to make a big loss. Taking longer than usual to graduate also destroys value. Both these outcomes are common. Across the rich world less than 40% of people studying for undergraduate degrees complete their courses in the expected number of years. About one-third still have no qualifications three years after that.

Choosing the right subject is crucial to boosting earning power. Negative returns are likeliest for Britons who study creative arts (less than 10% of men make a positive return), social care and agriculture (see chart 1). By far the best-earning degrees in America are in engineering, computer science and business. Negative returns seem especially likely for music and the visual arts. Using America's available data to guess lifetime earnings by programme is a stretch. But Preston Cooper at FREOPP, a think-tank, ventures that more than a quarter of bachelor's-degree programmes in America will lead to negative returns for most enrolled students.

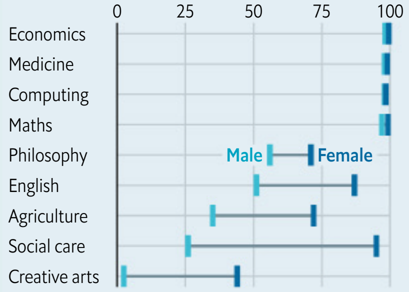
What you study generally matters more than where you do it. That comes with caveats: the worst colleges and universities provide students with little value, whatever they teach. But on average people who enroll in America's public universities get a better return over their lifetimes than students who go to its more prestigious private non-profit ones, reckon the Georgetown researchers. High fees at the non-profits is one of the reasons why.

Earnings data in Britain call into question the assumption that bright youngsters will necessarily benefit from being pushed towards very selective institutions, says Jack Britton of the IFS. In order to beat fierce competition for places, some youngsters apply for whatever subject seems easiest, even if it is not one that usually brings a high return. Parents fixated on getting their offspring into Oxford or Cambridge, regardless of subject, should take note. But there is also evidence that tackling a high-earning course for the sake of it can backfire. Norwegian research finds that students whose true desire is to study humanities, but who end up studying science, earn less after ten years than they probably otherwise would have.

Men have more reason than women to worry that their studies will be a bust. That is because they have a higher chance of earning well without a degree. University is a risk for those with mediocre school grades as they often earn less after graduation than better-prepared peers who hold the same degrees.

The value of nothing

England, students* getting a positive net return on their undergraduate degree, %



Source: "The impact of undergraduate degrees on lifetime earnings", Britton et al., *IFS*, 2020

*2002 GCSE cohort

In Britain the return from a degree is generally higher for South Asian students than for white ones, as they tend to study subjects such as business, and generally lower for black students (compared with what people of the same race typically earn if they do not go to university). In America, Asian students seem to have the least trouble paying off their student debts, compared with white and black students.

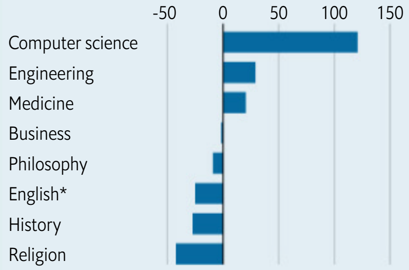
Marks and markets

What are the implications of all this analysis? Already there are signs that the higher-education market is evolving. People are searching out better returns of their own accord at different educational stages. In America the number of degrees conferred annually in English and in history fell by around one-quarter between 2011 and 2021 (see chart 2). The number of degrees in computer science more than doubled. Others are skipping college altogether: enrolment has fallen every year since 2011.

Institutions are also shifting by culling humanities. In February the trustees of Marymount University in Virginia voted to abolish majors in nine subjects including English and history. Calvin University in Michigan and Howard University in Washington, DC are among those which have abandoned classics. And archaeology's future at the University of Sheffield in Britain looks precarious.

Success is a science

United States, degrees awarded per academic year, % change 2011-21



*Language and literature

Source: National Centre for Education Statistics

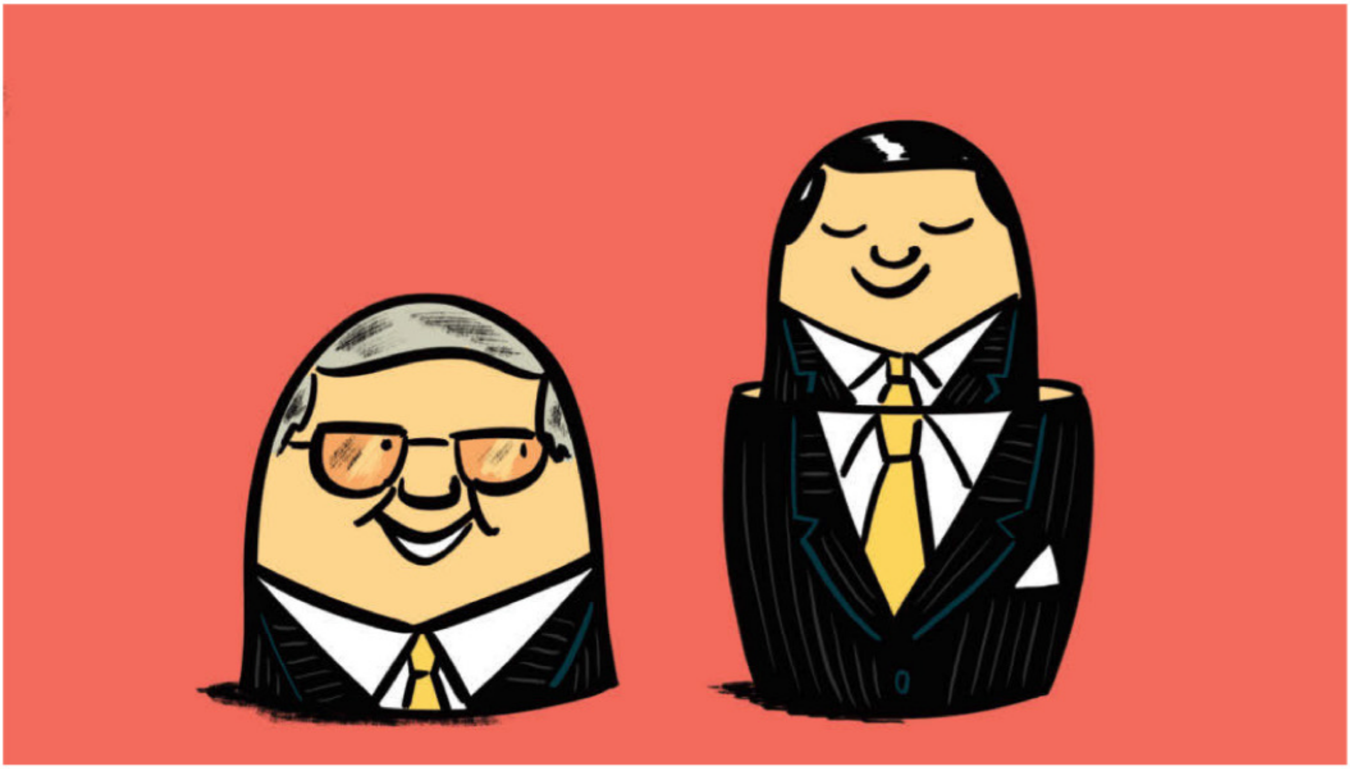
Employers are adapting, too. Firms are becoming a bit less likely to demand that job applicants have degrees, according to analysis by Joseph Fuller of Harvard Business School, and others. Tight labour markets and a desire for more diverse workers help explain why. A few years ago some 80% of the jobs that IBM, a tech giant, advertised in America required a degree, says Kelli Jordan, one of its vice-presidents. Now it is about half. "A degree does not have to be the only indicator of skills that someone may have," explains Ms Jordan.

Should governments amplify these trends? In Estonia one-fifth of an institution's funding depends on meeting a variety of targets; one relates to the share of students graduating on time. Similar systems exist in Finland, Israel and Sweden. Australia's government is trying to encourage learners to make socially useful choices. In 2021 it doubled what undergraduates pay to study social sciences, political science or communications and halved the fee for nursing and teaching. Students do not appear much moved yet, possibly because of the generosity of Australia's student-debt repayment terms. Britain's government reckons it can alter behaviour by giving everyone in England an online account listing a maximum cash sum that they can borrow from the state for studies over their lifetime. The idea is to make school-leavers more parsimonious.

Others still splurge. President Joe Biden hopes that the Supreme Court will soon approve a plan, announced last year, to write off a big chunk of America's student loans. He also wants a more lenient repayment system. The associated costs could mount to hundreds of billions of dollars over the next decade. Mr Biden also promises an official list of "low-financial value" courses. More compelling is talk of preventing feeble programmes from benefitting from federal student loans. But without an act of Congress this would mainly affect for-profit colleges (which enroll only a fraction of America's learners).

To many, a growing focus on the financial returns to higher education is crude. Graduates in public service are bound to earn less than those on Wall Street. Many disciplines are worth studying for their own sake. Yet students frequently tell pollsters that improving their earning power is a priority. Good returns are vital to the poorest learners. Today weak degrees are surprisingly common. A mix of better information, market forces and smarter policy can reduce their prevalence. ■

Business



Asian business

The millennial plutocrats

SINGAPORE

Meet the next generation of Asia's business elites

THE IDEA that wealthy dynasties can go to pot in three generations pops up throughout history and around the world. John Dryden, an English poet who died in 1700, mused that "seldom three descents continue good." In 19th-century America, successful families were said to go from "shirtsleeves to shirtsleeves" in that span of time. A Chinese proverb, *fu bu guo san dai* (wealth does not pass three generations) captures an identical sentiment.

As a rising share of the world's ultra-rich comes from emerging markets, the three-generation hypothesis is being tested once again—nowhere more so than in developing Asia. Asians are helping to swell the number of individuals with fortunes of more than $500m, which rose from 2,700 to nearly 7,100 globally between 2011 and 2021, according to Credit Suisse, a bank. The continent's tycoons did more than their African or Latin American counterparts to push the developing world's share of that total from 37% to 52% over the decade. The combined revenue of the continent's 80 or so family firms that rank within the world's 500 biggest such concerns surpassed $1trn last year, according to researchers at the University of St Gallen in Switzerland (see chart 1 on next page).

Overall, the results of the three-generation test so far look encouraging for Asia's ageing patriarchs (most are men) as they seek a safe pair of hands to which to entrust their legacy. The grandchildren of the region's founder tycoons may well be in shirtsleeves, but out of sartorial choice rather than necessity. They are worldlier than their elders, who built their fortunes on local businesses that thrive in periods of rapid economic development, such as construction or natural resources. They often blend the needs of the family business with personal preferences.

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At the same time, they are keenly aware of their responsibility to avoid the prodigal trap. As they take the reins of their business houses, it is up to them to show whether, in the words of one Asian heir, "you can institutionalise" and, like "a sort of Rothschild", keep generating wealth over centuries. (Members of the Rothschild family are shareholders in *The Economist*'s parent company.)

To understand what makes these Rothschild wannabes tick, start with education. Most have attended university abroad, often in America. Adrian Cheng, grandson of Cheng Yu-tung, a Hong Kong property tycoon, went to Harvard University. John Riady, the New York-born scion of an Indonesian business dynasty, attended Georgetown University, before earning an MBA at the Wharton School of the University of Pennsylvania and a law degree from Columbia University. Isha Ambani, daughter of Mukesh Ambani, graduated from Yale and then Stanford University's Graduate School of Business in 2018.

A foreign education distinguishes the new crop of tycoons from their grandparents, many of whom never completed university. What sets them apart from their parents is their career paths into the family businesses. Like their fathers, Mr Cheng, Mr Riady and Ms Ambani all now work for these. Mr Cheng runs New World Development, the family's property arm; Mr Riady is chief executive of Lippo Karawaci, the family empire's property developer; Ms Ambani heads Reliance's retail operation. But, like plenty of their peers, they took circuitous routes to get there.

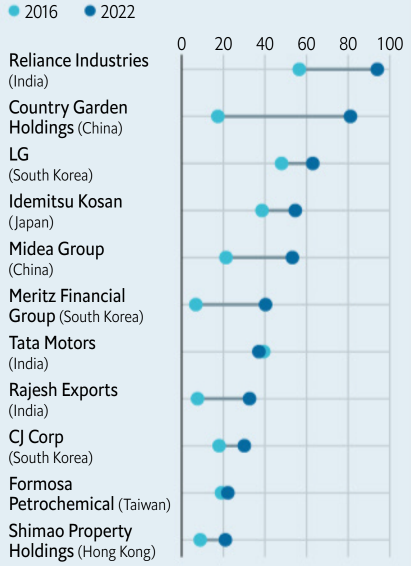
For many, that means a stint in finance or professional services. Mr Cheng started his career in investment banking, including at UBS, a Swiss lender. Ms Ambani was a consultant at McKinsey. Mr Riady worked in private equity. For others, the bridge is the world of venture capital and tech startups. Korawad Chearavanont, great-grandson of the founder of CP Group, Thailand's largest private company, launched a tech startup that provides social-media features for apps. Kuok Meng Xiong, grandson of Robert Kuok, a commodity, property and logistics billionaire from Malaysia, runs K3 Ventures, a Singapore-based VC firm.

Both in the case of foreign VC investments in Asia and of Asian investments in foreign VC firms, the heirs' fluent English, foreign education and Western social circles make them the ideal conduit. And these flows are growing: in the past two years VC investments in Asia averaged $150bn annually, more than half of America's $280bn or so, and up from $11bn in 2012, when it was a quarter of America's. Asian investments in foreign VC deals are up, too (see chart 2). In America, the share from Asia has gone from less than 10% by value a decade ago to around a quarter in 2022, according to Dealroom, a data firm.

Permitting the heirs to have a professional life outside the family is partly about letting them spread their wings (see Bartleby). "The first and second generation were quite traditional," says Kevin Au, director of the Centre for Family Business at the Chinese University of Hong Kong. But, he adds, they were happy to send their children abroad, "where values are different and business is done differently".

Clanning ahead 1

Asia, biggest* family firms by revenue, $bn



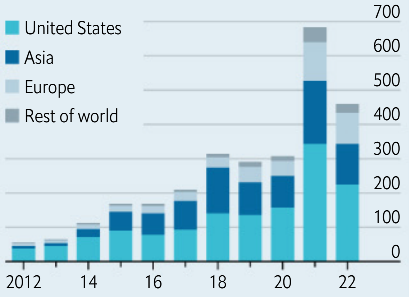
Source: Centre for Family Business, University of St Gallen

*With data available

The other Asian export 2

Venture-capital investments from Asia

By target region, $bn



Source: Dealroom.co

Impact investing and sustainability-related roles are popular among the millennial plutocrats. Rather than join Hyundai Group, Chung Kyungsun, grandson of its founder, Chung Ju-yung, has set up an impact-investment firm called Sylvan Group, which focuses on companies aligned with UN Sustainable Development Goals. The shift to more vocally progressive views in some areas, like inequality, may be driven by pragmatism, too. "In societies where economic growth isn't being shared, they want to break you up, tax you, regulate you, they presume the worst," says one heir.

Giving heirs experience beyond the family concern reflects a more open-minded parenting style. But it is also becoming a business priority for the older generation, especially as the family businesses diversify into new industries and geographies. Reliance, which made its name in petrochemicals, is now India's biggest telecoms firm and digital platform. Lippo has gained greater exposure to young technology firms in South-East Asia through Venturra Capital, its VC subsidiary. That young business scions have a wider circle of contacts than do their parents is useful for their families' firms: rubbing shoulders with would-be startup founders, venture capitalists, consultants and bankers offers opportunity for early dibs on interesting investment opportunities.

Last year Campden Wealth, a consultancy, surveyed 382 global family offices, the investment vehicles that manage dynastic wealth. It found that the majority would prefer the next generation of owners to gain external work experience before taking the reins. Globally, 54% of respondents said they expected their heirs to get at least a year of outside experience. In Asia the figure was 58%.

The more international and liberal mindset of the young plutocrats, then, holds promise for avoiding the three-generation trap. But it is not risk-free. Many developing-world commercial empires were constructed by combining business acumen and political nous. In 2001 Raymond Fisman, then at Columbia University, showed that whenever rumours about the failing health of Suharto, Indonesia's dictator, intensified in the mid-1990s, publicly listed firms that were close to the government, many of which were family-run, underperformed those with fewer political ties. Similar research suggests a positive association between the political allegiances of South Korean companies and the government: firms with ties to the ruling party benefited even after the country's transition to democracy and economic liberalisation in the late 1980s.

In many emerging markets, navigating interest groups and local power brokers remains an important part of doing business. It can ensure preferential treatment, access to state contracts or just a better understanding of the often Byzantine bureaucracy. American business schools will not teach Asia's young business elites such skills (see Schumpeter). To preserve their family empires, they will also have to learn a thing or two from their elders. ■

AI and entertainment

Game changer

Artificial intelligence is disrupting the industry that brought it to life

FLINGING BRIGHTLY coloured objects around a screen at high speed is not what computers' central processing units were designed for. So manufacturers of arcade machines invented the graphics-processing unit (GPU), a set of circuits to handle video games' visuals in parallel to the work done by the central processor. The GPU's ability to speed up complex tasks has since found wider uses: video editing, cryptocurrency mining and, most recently, the training of artificial intelligence.

AI is now disrupting the industry that helped bring it into being. Every part of entertainment stands to be affected by generative AI, which digests inputs of text, image, audio or video to create new outputs of the same. But the games business will change the most, argues Andreessen Horowitz, a venture-capital (VC) firm. Games' interactivity requires them to be stuffed with laboriously designed content: consider the 30 square miles of landscape or 60 hours of music in "Red Dead Redemption 2", a recent cowboy adventure. Enlisting AI assistants to churn it out could drastically shrink timescales and budgets. ▸▸

Gamemakers showed off their latest AI tricks at the Game Developers Conference in San Francisco last month. Ubisoft, a French developer of blockbusters such as "Assassin's Creed", unveiled Ghostwriter, a tool that generates dialogue for in-game characters. Roblox, an American platform for DIY games, launched one that draws materials from text commands, like "stained glass", and an autocomplete helper for programmers. A few weeks earlier Straight4 Studios previewed a new driving game, "GTR Revival", with personalised racing commentary delivered by AI.

AI represents an "explosion of opportunity", believes Steve Collins, technology chief of King, which makes "Candy Crush Saga", a hit mobile game. King, which bought an AI firm called Peltarion last year, uses AI to gauge levels' difficulty. "It's like having a million players at your disposal," says Mr Collins. This year Electronic Arts, another big gamemaker, and Google both received patents for using AI in game testing. Unity, a game-development "engine", plans a marketplace for developers to trade AI tools. Danny Lange, Unity's head of AI, hopes it will "put creators of all resource levels on a more equal playing-field".

Making a game is already easier than it was: nearly 13,000 titles were published last year on Steam, a games platform, almost double the number in 2017. Gaming may soon resemble the music and video industries, in which most new content on Spotify or YouTube is user-generated. One games executive predicts that small firms will be the quickest to work out what new genres are made possible by AI. Last month Raja Koduri, an executive at Intel, left the chipmaker to found an AI-gaming startup.

Don't count the big studios out, though. If they can release half a dozen high-quality titles a year instead of a couple, it might chip away at the hit-driven nature of their business, says Josh Chapman of Konvoy, a gaming-focused VC firm. A world of more choice also favours those with big marketing budgets. And the giants may have better answers to the mounting copyright questions around AI. If generative models have to be trained on data to which the developer has the rights, those with big back-catalogues will be better placed than start-ups. Trent Kaniuga, an artist who has worked on games like "Fortnite", said last month that several clients had updated their contracts to ban AI-generated art.

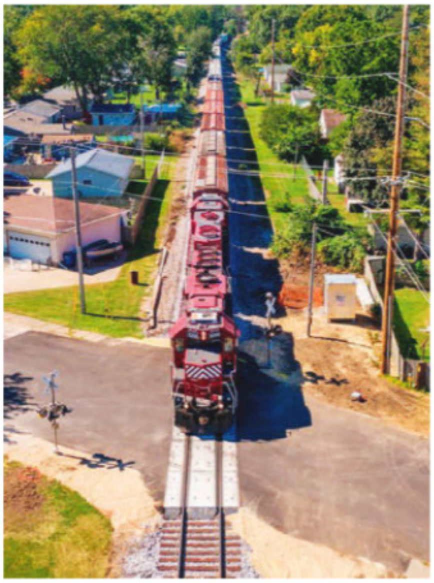
If the lawyers don't intervene, unions might. Studios diplomatically refer to AI assistants as "co-pilots", not replacements for humans. But workers are taking no chances. The Writers' Guild of America, whose members include game scriptwriters, said in March that "plagiarism is a feature of the AI process." In Hollywood, it is threatening strikes. Upset creatives may press pause on the games business, too. ■

American freight

Watching the wheels

NEW YORK

Truckers and railwaymen face leaner times ahead



Railways at a crossroad

In some ways, freight rail and trucking seem to be direct competitors. Companies that need to get a container of goods from one city to another can choose between them. Rail is more cost-effective, fuel-efficient and can move greater volumes on a single trip. Trucking is usually faster and, unless the container is going from rail yard to rail yard, more direct. In America, both sectors boomed during the pandemic, as service-deprived shoppers stocked up on stuff. Now both are bracing for an economic slowdown, which may also affect them in similar ways.

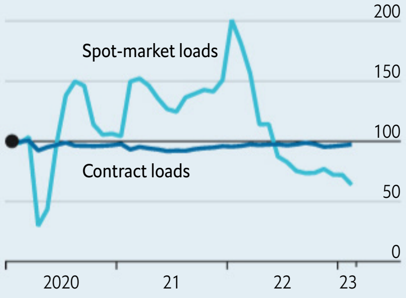
Start with rail. Cost-cutting and price rises brought huge profits to American freight-rail firms in 2021 and 2022, despite lower volumes than before the pandemic. Railways embraced "precision scheduling", which reduces how long full train carriages sit in yards waiting for a long train to be built. The industry is also consolidating, which leads to greater pricing power. On April 14th Canadian Pacific will complete its purchase of Kansas City Southern, the first big freight-rail merger that the Surface Transportation Board (STB), the federal rail regulator, has approved since the 1990s. That will leave America with just six large "Class I" rail companies.

Counterintuitively, the merger may end up enhancing competition. That is because not all rail companies compete against each other directly. Rather, the country is split into duopolies: CSX and Norfolk Southern rule the east; Union Pacific and BNSF dominate the west. Those lines meet in the Midwest, where they compete with Canadian National and, now, the enlarged Canadian Pacific, which will provide the first train lines running from Canadian ports through the heart of America into Mexico.

Spot the oddity

United States, trucking volumes

January 2020=100



Sources: American Trucking Associations; DAT

Instead of less choice, in other words, customers in America's most crowded rail corridor, which runs through the centre of the country, will now have the option of moving goods on a single line from the northern to the southern border. It was this "end-to-end" nature of the merged company—with no overlapping tracks or shared customers—that the STB invoked as one reason for waving through the combination of the two smallest Class I firms.

If the merger is unlikely to boost margins for the industry, could more cost-cutting? Probably not. Fuel, though down from recent peaks, remains pricier than before the war in Ukraine. Precision scheduling has come under scrutiny after a chemical-train derailment in Ohio in February; critics have blamed the pressure to get trains out of yards as quickly as possible for corners being cut on safety inspections. If Congress passes rail-safety legislation, that may reduce efficiency and increase costs. Non-fuel expenses such as insurance are already going up.

So are labour costs, as rail firms recruit workers to improve service. At the start of 2023 they employed 8% more people than a year earlier, even though volumes and traffic had fallen in the preceding 12 months. Amit Mehrotra of Deutsche Bank notes that adding staff even as volumes decline is a sign that "rail is playing the long game and focusing on service." But, he concedes, "the bumper-profit period is over."

The same could be true for hauliers, for many similar reasons. During the pandemic, demand soared and the number of trucking firms, starting one of which requires little more from an entrepreneur than securing the right licence and a lorry, steadily increased. Today America has nearly 600,000 such companies, 100,000 more than in 2019. Capacity has been recovering from a covid-induced dip: in February it was 4% higher than the year before. But the market is much softer: in the fourth quarter of 2022 freight volumes fell to their lowest level since 2014.

The combination of robust supply and weakening demand has produced an unusual pricing situation. Typically, rates in the spot market, which shippers use when they have freight to move straight away, exceed contract rates, which shippers and trucking firms set for a fixed term, usually a year. For roughly the past 12 months, says Dan Murray of the American Transportation Research Institute, an industry body, "the spot market has been on life support" (see chart on previous page). In February, spot rates were more than 70% lower than the year before—and below contract rates.

This price signal could lead some truckers to call it a day. Others may, like their railway rivals, try to consolidate. On March 21st Knight-Swift, one of America's biggest truckers, agreed to buy biggish but struggling US Xpress. Mr Murray thinks that "more acquisitions are coming", not least because spot prices look unlikely to recover for another six to 12 months.

In the longer run, however, things may be looking up for American truckers and railwaymen alike. The government is ploughing hundreds of billions of dollars in subsidies to boost domestic manufacturing, particularly of green-energy equipment and semiconductors. If those handouts have the desired effect, that could mean more intermediate goods, in addition to finished products, to ferry around America's vastness. ■

Bartleby The lure of the family business

The pros and cons of following in your parents' footsteps

Family business makes for compelling drama. Just ask anyone tuning in to the final season of "Succession", which has recently begun airing on HBO. This Bartleby prefers "Buddenbrooks", Thomas Mann's chronicle of the decline and collapse of a German merchant family over the course of four generations. That novel, first published in 1901, drew heavily on the author's personal experience. The dilemmas of working for an organisation which an immediate family member runs or in which they own the majority sound alarming enough in fiction, never mind real life. And nepotism can be plenty dramatic even without the plot twists.

These days it is frowned upon—most publicly listed companies and professional firms ban it. Still, family businesses make up more than 90% of the world's enterprises. Many of them, quite literally, are mom-and-pop shops. Some are large-ish businesses in smallish economies, like the one in Athens where this guest Bartleby, straight out of university, was put in charge of managing relations with institutional investors. A handful are giant global corporations: think of Rupert Murdoch's media empire (which allegedly inspired "Succession") or Bernard Arnault's $460bn luxury conglomerate, LVMH (which, as it happens, has grown by acquiring other family firms, such as Bulgari and Fendi).

Regardless of size, all family companies face common challenges. Filial loyalty and multi-generational thinking can morph into resistance to change, and if a firm has outside shareholders, clash with their interests. The process of generational transition can be particularly draining and frustrating to the staff members who are not family, raising uncomfortable questions about social mobility, or the lack thereof.

For the corporate heir, meeting family expectations and continuing a legacy while achieving personal fulfilment can generate a mass of contradictions, as Mann splendidly illuminated. Even in companies that insist they are meritocratic, no amount of skill will convince all your colleagues that you have actually earned your job. Any pre-existing domestic frictions might make their way into the business. And vice versa: disagreements over the business can breed feuds, often between siblings. In India, the bitter dispute between Mukesh and Anil Ambani over their inherited empire, Reliance Industries, lasted for years after their father died without leaving a will.

No wonder some heirs decide to hold on to their shareholdings, perhaps a board seat, but pursue a career elsewhere. Not all Waltons work for Walmart; it is hard to find Hoffmanns among executives at Roche, the Swiss drugmaking giant founded by their forebear in 1896. They thus avoided being accused of belonging to the "lucky sperm club", as Warren Buffett calls those who might well possess the managerial skills to lead a large organisation but never had to jump through the same hoops as everyone else. Hilton and Marriott, two of the world's biggest hotel chains, as well as Lego, a toymaking giant, are examples of companies which did not produce a strong successor and eventually ended up in the hands of professional managers.

For those who nevertheless decide to take an active role in the family business, it does not have to be a poison. Some of the logic that historically made family firms de rigueur continues to stand. For example, designated heirs—like Mr Arnault's five children, all of whom now run parts of LVMH—are groomed early on, so by the time they are ready to take over they have already acquired some industry knowledge by osmosis.

At the personal level, work is not solely about money but also about empowerment and prestige. Your name on the door may bestow a sense of purpose. Preserving the legacy of an empire can be rewarding, so long as the heir displays passion and persistence. They can probably forget being one of the gang when it comes to office gossip, but they can earn their colleagues' and subordinates' respect with modesty and hard work. The serious heir knows that showing up simply because it is easier than venturing out on their own doesn't cut it.

Ultimately, being entrusted with a business by people who share your DNA is something you ought to earn, not expect. As the adage goes, "A family business is not a business you inherit from your parents, it is a business you borrow from your children." Disregard for this nugget of wisdom is what makes "Succession" such riveting television—and Waystar Royco so dysfunctional.

Accounting

Why, EY?

BERLIN

Germany serves the beleaguered auditing giant another blow

Rebuilding a reputation

EY JUST CAN'T get a break. The accounting-and-consulting giant is being sued for $2.7bn by the administrators of NMC, a London-listed hospital operator it had audited and which went into administration after understating debts by $4bn. EY is being investigated by the Financial Reporting Council (FRC), a British regulator; the firm denies the administrators' claims of negligence. Its plan to unshackle an advisory business constrained by its inability to work with audit clients, codenamed "Project Everest", is in doubt amid a rebellion by a group of American partners. And on March 31st its German arm received the harshest penalty ever meted out by APAS, Germany's accounting watchdog, which includes a €500,000 ($548,000) fine and, worse, two-year ban on auditing new publicly listed clients in the country. This is a financial blow to the firm—and an even bigger reputational one.

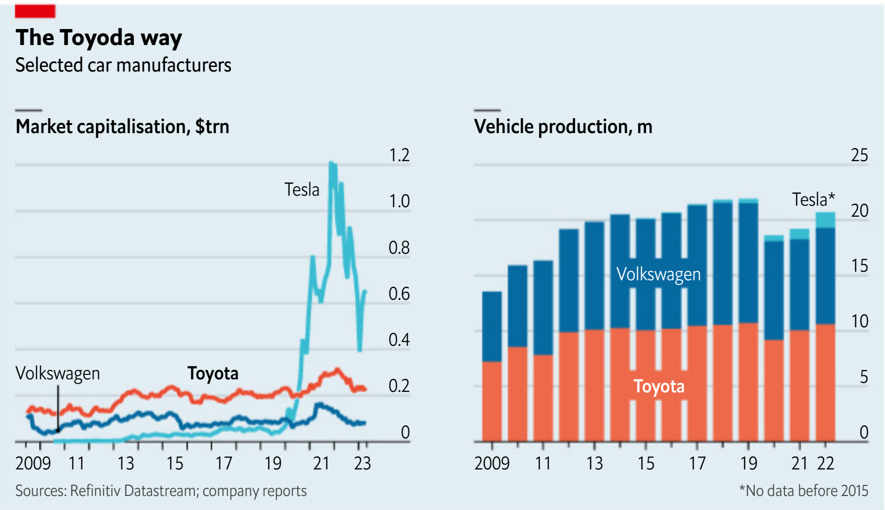
APAS's decision comes after a three-year investigation into EY's role in the demise of Wirecard, a fintech darling turned Germany's biggest post-war corporate scandal. EY had given Wirecard a clean bill of health for a decade until the company collapsed in 2020 amid allegations of massive financial fraud. APAS now says that it considers it "proven" that between 2016 and 2018 EY violated its duty of care during the audit of Wirecard and Wirecard Bank. Five current and former employees were also fined between €23,000 and €300,000. Seven other employees who were also under investigation escaped punishment by handing back their auditor's licences. In a statement, the firm said, "EY Germany has fully co-operated with APAS throughout its investigation. We regret that the collusive fraud at Wirecard was not discovered sooner, and we have learned important lessons from this matter."

After its cockups in recent years EY has indeed been trying to get better at spotting mischief. In 2021 it said it would invest $2bn over three years in improving its audits, including upgrading its technology the better to detect fraud. But no auditor is likely to get things right every time. Indeed, scandals such as Wirecard and NMC go to the heart of the so-called "expectations gap" in auditing. Auditors insist that their services cannot be treated as a guarantee that accounts are truthful, and note that sophisticated frauds are by their nature difficult to spot. And it is not the only auditor to be embroiled in controversy. In 2020 Deloitte was fined £15m ($19m) by the FRC for "serious and serial failures" in its audit of Autonomy, a business-software firm. HP, an American tech firm that bought Autonomy in 2011, alleged that its target had misstated its accounts.

Regulators, for their part, think audits could be improved. They have tried to increase competition. For instance, in Europe firms must rotate their auditors, typically after ten years. Yet despite such efforts, audit remains a cosy oligopoly. The so-called "big four"—Deloitte, EY, KPMG and PWC—together audit nearly all large listed companies in Europe and America, weakening incentives to invest in audit quality. For example, EY is currently auditing 12 of the 40 companies in the DAX, the stockmarket index of German blue chips, according to *Wirtschaftswoche*, a business weekly. They include giants such as Deutsche Bank and Volkswagen. Its main rivals, PWC, KPMG and Deloitte, work for 12, ten and five DAX firms, respectively.

Next year several DAX companies will decide whether to renew the mandates of their respective auditors. Siemens, Siemens Energy and Siemens Healthineers, three engineering firms, have already said they will end their contract with EY, though that is also related to the obligation to rotate auditors. Other clients in statutory need of a new auditor will be unable to switch to EY because of the ban even if they want to—which, given the damaging publicity, they may not.

EY's rivals will be watching the fallout closely. So will its partners elsewhere in the world. The fact that, like other global accountants, EY operates a franchise-like structure, with independent partnerships in each country, will not spare the wider network from reputational damage. As for EY Germany, it remains keen on Project Everest. For the firm's German advisory business, the divorce from the tarnished audit arm cannot happen fast enough. ■



Sources: Refinitiv Datastream; company reports

*No data before 2015

The Lexus nexus

On April 1st, after nearly 14 years as boss of Toyota, Toyoda Akio handed the wheel to his successor. Sato Koji, formerly chief engineer of the Japanese carmaker's premium brand, Lexus, has his work cut out. Toyota continues to produce more vehicles than any other firm. Its market value is almost three times as high as its closest rival in terms of output, Volkswagen. But it came late to battery-electric vehicles, having bet that hydrogen was the answer to zero-emission driving. Meanwhile firms like Tesla have thrived, ushering in more electric-vehicle startups. Other established carmakers, Volkswagen chief among them, have quickened the pace of electrification. All that has left Toyota in the dust. In 2022 its total battery-EV sales ranked 24th in the sector.

Schumpeter | Managing expectations

What the world's hottest MBA courses reveal about 21st-century business

STANFORD UNIVERSITY'S Graduate School of Business (GSB) exhorts its students to dream big. When one of its alumni in the class of 2006, Rishi Sunak, became Britain's prime minister last year, the dean welcomed the news as if it had always been inevitable. "Rishi's experience at Stanford raised his aspirations," he proclaimed in a school-wide email. The GSB prides itself on offering the world's most selective MBA programme. Its class of 420 students is less than half the size of that of its arch-rival, Harvard Business School—and represents just 6% of applicants, compared with 10% or so for HBS. Although not all of them can be heads of government, many will follow alumni such as Asia's richest man, Mukesh Ambani, or Detroit's mightiest woman, Mary Barra of General Motors, into corporate stardom.

This makes the GSB the perfect place to glimpse the future of management. And there may be no better lens through which to examine it than the MBA programme's most oversubscribed courses. Where the GSB's highly driven bosses-to-be choose to spend their precious time speaks volumes about what they think will matter to their careers. And, given the clout they will eventually wield, those revealed preferences are going to define how the world's most successful companies will be run.

Management education involves wading through case studies, poring over financial statements and building sophisticated spreadsheets. And, like any MBA curriculum worth its salt, the GSB's has compulsory classes in accounting, finance and computer modelling, to be completed within the first two terms of instruction, out of a total of six. Look at the school's three most popular facultative courses, though, and a more interesting picture emerges of the 21st-century manager. All three require virtually no number-crunching. Instead they aim to cultivate in students a capacity for hardheadedness, introspection and diplomacy, respectively. It is these attributes, the students appear to be saying, rather than any technical expertise, that will determine success.

The first leg of the triad is a module called "Paths to Power". Students like to quip that it is designed for the budding Machiavellian. The opening line of the course syllabus laments that "insufficient sensitivity to, and skill in, coping with power dynamics" have cost many talented people promotions and even their jobs. The objective of the course, writes Jeffrey Pfeffer, the instructor, is to make sure "you never have to leave a position involuntarily".

One way to maintain power, students are taught, is to avoid grooming successors. MBAs are quick to draw parallels with contemporary events. After a recent lecture a student observed that Donald Trump naively "created his own competition" when he endorsed Ron DeSantis for governor of Florida in 2018. How to guard against scheming rivals? One way is to hold "multiple overlapping roles" within an organisation, as an assigned reading recommends: it is harder to be defenestrated if multiple teams report to you. Xi Jinping, who holds at least ten titles, including China's president and Communist Party chief, is not known to have taken Mr Pfeffer's class but seems to have internalised its lessons.

If "Paths to Power" trains future leaders to conquer external opposition, "Touchy Feely" directs them to turn their gaze to their own public image. The course, perhaps the GSB's most famous, has been running for half a century. Its aim is to help students assess whether the way they come across to others is the way they want to be perceived. Much of the class consists of unstructured conversation in groups of 12, plus a weekend retreat. No topic is off the table; dating history, mental health, political orientation are all fair game. Students are instructed to observe each other's behaviour, from emotional expressiveness to problem-solving skills.

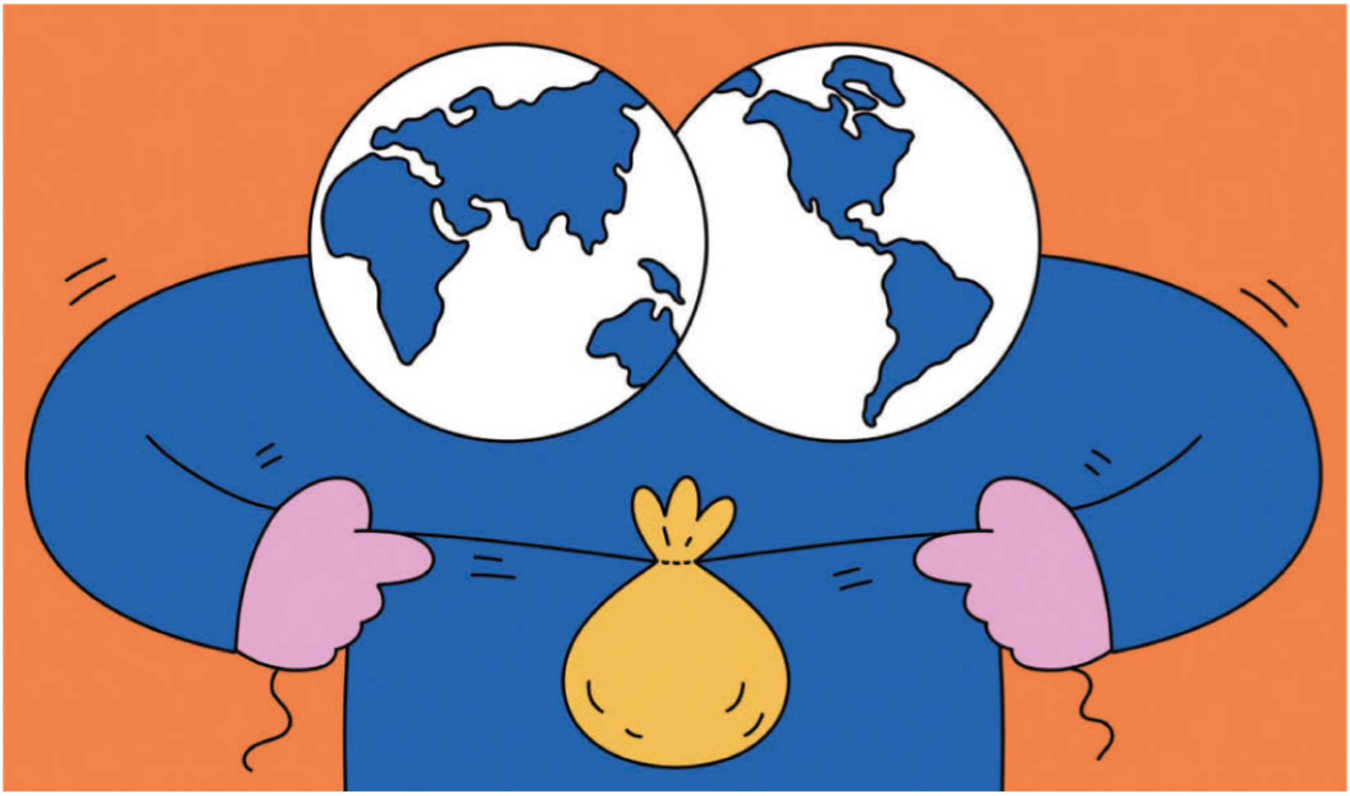
The course culminates in an activity that is known to induce tears in some. Students are asked to sort themselves into a line according to the degree of "influence" each person possesses. Those convinced of their own brilliance may try to insert themselves at the front of the pack. They risk getting rebuffed. Disagreements often erupt as others jostle for position near the front. It is humbling, even traumatic, to be consigned to the back of the line. Yet this exercise in tough love offers a chance for self-discovery. Only when you know your weaknesses can you act to mitigate them. For some this might mean speaking more forcefully. For others it could mean frowning less and smiling more.

The third popular course, "Managing Growing Enterprises", is not, as its name might suggest, about small-business accounting. Rather, the focus is on how to deal tactfully in sensitive situations, when many aspiring managers are tripped up by an inability to find the right words. How do you lay someone off? How do you decline unsolicited and unhelpful advice from a big investor? How do you respond to a nosy journalist? The course is structured around role-playing, in which a handful of students are cold-called each session to act out such exchanges. The professor and other students offer feedback, which can be scathing. Prospective students who visit the GSB are regularly invited to sit in on MGE, as the class is commonly known on campus. Applicants from Asia, many of whom have been brought up to be conflict-averse, appear particularly engaged, taking copious notes as the role players in the classroom try their best to be diplomatic but firm.

The four pillars of the corner office

A degree of ruthlessness, self-awareness and tact can, of course, a familiar mix in corner offices and boardrooms past and present. The GSB's courses suggest that they are likely to remain commonplace for the foreseeable future—though in varying proportions depending on the individual. They will also always be supplemented by a fourth characteristic. The admissions director who accepted Mr Sunak nearly 20 years ago recalls that the young Rishi exuded a certain "selfless ambition". No course can teach steely determination—not even at the GSB. ■

Finance & economics



The IMF

Nightmare on 19th Street

WASHINGTON, DC

A bastion of the post-war economic order faces an almighty identity crisis

During the landmark three-week conference at Bretton Woods in 1944, one delegate contrasted the "extraordinarily beautiful" venue—the Mount Washington hotel—with the "glorious confusion" of negotiations. Yet the bedlam gave birth to the world's most important international economic institution: the International Monetary Fund (IMF), which was founded to ensure global macroeconomic stability. In the nearly 80 years since its creation, the fund has lent $700bn to 150 countries.

When the IMF meets for its spring jamboree in Washington on April 10th there will once again be confusion about its purpose. Only this time it will not be glorious but ominous. Like many liberal institutions built after the second world war that could both serve American interests and claim to represent all of humanity, the fund is now ensnared by the Sino-American rivalry. Everyone—including the countries which negotiate and vote on the fund's governance, the creditors which lend to countries it bails out, and its staff—seems uncertain about the fund's future.

This is quite a reversal. Three years ago the IMF was poised to orchestrate a grand policy response to covid-19. In reaction to the crisis, the fund boosted by $185bn the amount it could raise from central banks to lend to distressed economies. Commitments from rich countries, the fund's first source of borrowed capital, doubled to $482bn. The IMF brokered a deal at the G20, including China, to freeze interest payments for poor countries. And it doled out $650bn in "Special Drawing Rights", its own quasi-currency made up of a basket of those of its biggest members, to central banks to lend to poorer countries. The IMF, it seemed, was fulfilling its modern mission: to backstop countries in distress and, by extension, the world economy.

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The trouble is that, amid what is already the largest debt crisis since the 1980s (judged by the share of world population affected), the IMF's efforts have been variously hamstrung, hesitant or irrelevant. Nearly $1trn has been injected into the fund since covid began to spread, but its loan book has grown by only $51bn. The fund has managed to approve just $2bn, or 5% of the capital it raised for new lending facilities, to tackle everything from climate change to food shortages, and even this money is yet to leave its accounts. Poor countries have struggled through the pandemic, Russia's invasion of Ukraine and rising interest rates mostly on their own.

Three factors explain the IMF's enfeeblement. First, the intransigence of Chinese creditors that have lent to poor countries. Second, the parlous state of middle-income countries in perennial distress, for which loans are as much about geopolitics as economics. Third, the IMF's inability to execute a plan, pushed by its leadership, to use resources for purposes that are less diplomatically controversial, such as big-ticket climate loans and health policies.

Chinese creditors cause problems when the IMF approaches debt restructuring. Before the fund can lend it must be sure that a country's borrowing is sustainable. This usually requires an agreement to restructure—jargon for writing down—existing debts. The write-downs were once agreed in smooth IMF-led talks between Western countries in the “Paris Club” of creditors. China’s rise over the past 20 years as a big lender has made this all but impossible. At least 65 countries owe China more than 10% of their external debt.

Many are now in trouble. There are at least 21 countries, including Malawi and Sri Lanka, in default or seeking restructuring. Together these owe $1.3trn (on average 93% of local GDP) and are home to 718m people. The G20’s “Common Framework”, a loose accord between creditors including China, agreed in 2020, was supposed to help solve the problem. It has turned out to be a weak agreement, having yielded just one paltry deal in Chad since it was signed.

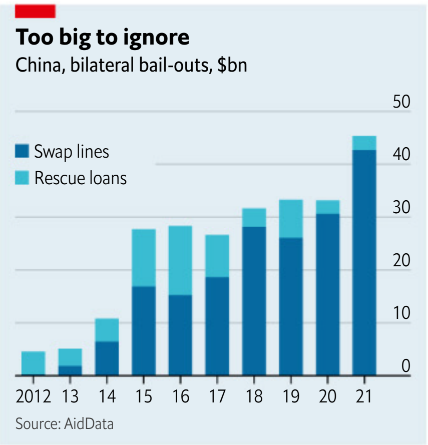
Speaking after a visit to China, Kristalina Georgieva, the IMF’s managing director, says the country is now engaged with the fund: “The question is no longer ‘Should there be a reduction [in borrowers’ debts]?’, but ‘How much?’ and ‘Through what instruments?’.” Yet China has not cut the face value of its loans and, despite vague assurances to the contrary, has not stretched out repayments to meet the IMF’s conditions.

China has two main objections to the way the IMF does things. One is that the country’s policy banks, such as China Development Bank, usually count as state lenders not private ones (the latter tend to get off more lightly in restructuring). The second is that multilateral institutions like the fund do not take write-downs, which China sees as the West getting off scot-free. Disagreement between Beijing’s ministries complicates matters. “The people who engage in this issue are not yet necessarily on the same page,” notes Ms Georgieva.

Without China’s involvement in a restructuring, IMF bail-outs might simply flow to Chinese pockets. The result of the country’s absence is thus an impasse. A government seeking restructuring is already in dire straits; typically reserves have run dry, capital is in flight and inflation is spiralling. The longer a restructuring is put off, the more painful it will be eventually.

At least seven of the 21 troubled countries have been waiting more than a year for a deal since defaulting. Ethiopia has had to wait more than two years for restructuring without receiving a dollar from the IMF. Other countries, including Suriname and Zambia, have secured IMF packages, but find themselves struggling to unlock the bulk of their funds because China is blocking restructuring.

“We have worked very hard to get the Chinese leadership to recognise that with more wealth comes more responsibility,” says Ms Georgieva. Success has so far been limited. As Brad Setser of the Council on Foreign Relations, a think-tank, notes, “They’ve had three years, and the arguments have got more and more ridiculous.”


Too big to ignore

China, bilateral bail-outs, $bn

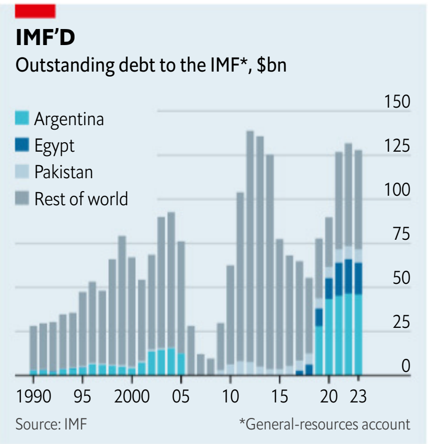
Source: AidData

There is one way to get the fund moving again: its “lending-into-arrears” policy, which was first used after Russia boycotted a restructuring of Ukraine’s debt in 2015. The idea is to circumvent an intransigent creditor, by using safeguards to freeze them out of the benefits of a restructuring. Western countries might lend to a highly indebted country if they were convinced that China would not benefit from their generosity. American officials are thought to be open to the notion.

Anti-China alliance

The catch is the safeguards’ stringency. Western creditors would want to be sure they are not bailing out Chinese creditors. Countries receiving loans “into arrears” would in effect have to promise to default on Chinese loans today and not borrow from China again anytime soon, on pain of losing access to the IMF. It is an idea that could reshape the fund. Although it has always been dominated by America, which holds 17% of voting rights in a system requiring 85% agreement, it is in theory an institution that runs to rules agreed at a table around which all nations may sit.

The fund’s second problem concerns a different set of economies: middle-income repeat-offenders to which it has grown reluctant to lend owing to their inability to follow through on reforms. Since 2000 Pakistan has spent 14 out of 23 years in some form of IMF emergency triage, under a total of seven lending programmes, three of which it has not managed to repay. The country is yet to complete a single course of fiscal conditions from any of the deals. Its leaders have been asked to collect local taxes 17 times, and reform the same sales tax in every check-up the fund has done.


IMF’D

Outstanding debt to the IMF*, $bn

Source: IMF

*General-resources account

Pakistan is not the only laggard. Egypt has hosted four programmes in under a decade. Argentina, the worst offender, has had to fudge targets in its most recent bail-out, worth $44bn and granted last year. It was once believed the fund could impose the “Washington consensus” on feckless governments with the stroke of a pen. Now it looks like it is being taken for a ride. “There are some programmes,” says Carmen Reinhart, chief economist of the World Bank from 2020 to 2022, “for which one has to have a sense of humour.”

There are few things more difficult than predicting the path of developing economies. Mistakes are inevitable and the fund’s economists should be forgiven for erring on the side of optimism. But Argentina, Egypt and Pakistan are no mere outliers. The three now make up more than half of lending from the fund’s general-resources account. Add in smaller economies with similar dire records, such as Angola, Ecuador and Jordan, and the figure rises to more than two-thirds. What to do with this gang is a mind-bending conundrum. Your correspondent spoke to a handful of former chief economists at the IMF—none wanted to offer the fund’s leadership advice on the subject.

The result has been an unsatisfying muddle. The fund has made a lot of small loans; it is too afraid to put serious money on the table, and too political to take it off altogether. “The fund’s leadership,” says a former official, “can’t even commit to its own cold feet.” In 2022 Barbados got two rapid-fire deals worth less than $300m. In the IMF’s most recent deal with Egypt, agreed in December, it committed just $3bn; puny in comparison with the $30bn that the fund strong-armed Saudi Arabia and the UAE into giving. In Pakistan, IMF officials are trying to revive a $1.1bn deal, an amount worth less than 1% of the country’s external-debt stock. While negotiations took place, China quietly deposited at least $4bn in Pakistan’s central bank.

“The IMF has now landed on the worst of both worlds,” says another former official. The fund is losing its leverage. It has a huge amount on the line from earlier lending. But new packages are small enough that borrowing countries suspect flouting their accompanying orders is better than displeasing Gulf creditors, which are less stingy. The IMF often lends at punitive rates, thanks to a surcharge intended to encourage countries to borrow from domestic banks. *The Economist* calculates that Argentina's interest payments on a $57bn bail-out, agreed in 2018, come to 8%. The fund could push countries to restructure debts if it did not want to lend more generously, but this would require it to be confident about the process for write-downs, which is in a terrible mess.

The fund's third problem is mission creep. Since 2010 it has picked up an array of causes to champion. These range from gender equality to fragile societies. Few are related to the fund's mandate to help solve countries' balance-of-payment problems and watch over global economic stability. Until recently, they never became anything more than a few research papers and some lines buried in its reports.

But in the past few years, as the IMF has struggled to do its day job, it has become more serious about its side-gigs. The fund is now banking on them to kick-start lending. Last April it established the Resilience and Sustainability Trust, a pot of $40bn for countries to spend on long-term climate and health projects. This was later joined by the Food Shock Window, another lending programme for countries, this time to fix food-supply-chain problems. The issue is that the IMF's staff are used to doling out cash to central banks and finance ministries in exchange for reforms, not micromanaging environmental evaluations. So far, the side-gigs have come to little of note. A year in, the fund has agreed to lend only $2.6bn of the Resilience and Sustainability Trust's $40bn.

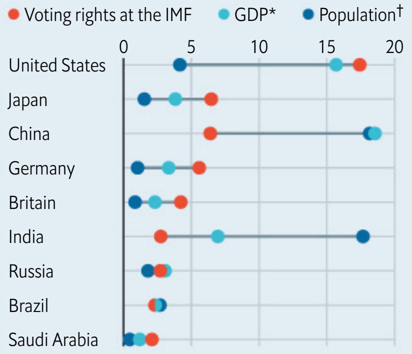
"Turning the IMF into the World Bank is not going to work," says Kenneth Rogoff, the fund's chief economist from 2001 to 2003. For 70 years, the two institutions have split their work. The IMF stabilises the world economy; the World Bank finances global development. The IMF lends short; the World Bank lends long. The IMF offers liquidity; the World Bank finances things. Climate change and bad health are barriers to growth in poorer countries. They require long-term finance. Thus they should come under the bank's remit.

There are only so many people with the skill to make tricky calls on climate finance or poverty reduction. The IMF is nabbing staff from the World Bank (who are lured by better pensions and benefits on the west side of 19th street). Yet the fund still cannot get health and climate cash out the door. It is hard to find projects that meet its tough criteria. Setting up green bonds, which the fund has been doing, is handy but hardly tops development wish lists.

Since the IMF will struggle to become a World Bank clone, it therefore faces a choice of two paths. One is to cut China out by labelling it an intransigent creditor, and circumventing it; in the process becoming the emergency-lending arm of a Western-led, democratic sphere, part of a cluster of institutions that tries to tempt emerging powers into a liberal bloc, instead of an autocratic one. The other is irrelevance.

Weighty problems

Selected countries, 2022, % of total



*At purchasing-power parity
†Estimate

Sources: IMF; UN; World Bank

In practice, the first option may simply involve bringing rules into line with reality. The American delegation was at Bretton Woods "for one purpose: to protect its interests", reported Harry Dexter White, the group's leader. America's de-facto veto over the IMF board, which has the final say on which countries receive money, means the fund has always been swayed by Washington. In 1995, under pressure from America, the fund pushed Japan to agree to an eye-wateringly generous bail-out for Mexico. In 1999 economists found that voting with America at the UN aided distressed countries' chances of an IMF package and granted them leeway to flout conditions. America's allies also benefit. The fund bailed out Greece, Ireland and Portugal under pressure from France, Germany and the European Central Bank (all of which could have done more instead) with then-record packages in the early 2010s.

However the IMF responds, it and China are already in competition. According to Professor Reinhart, China is building an emergency lender via its central bank (the PBOC) and policy banks. Since 2012, distressed economies have accessed $170bn through previously dormant swap lines with the PBOC. Researchers at Boston University find that for every 1% of GDP a country borrows from China, it becomes 6% less likely to reach a deal with the IMF. From 2016 to 2021, China's emergency lending came to 130% of the IMF's total.

Making Sino-American competition explicit would nonetheless be a watershed for an institution that is supposedly a bastion of liberal universalism. Given the other path is continued stagnation—akin to that facing the World Trade Organisation, an institution frozen by geopolitical conflict—it may also be the best available.

Either way, the fund probably needs to shrink for a simple reason: underlying demand for emergency loans is falling. Big emerging markets such as Brazil and Thailand have spent years building up reserves and swap lines to avoid the fund's clutches. They have deep domestic markets for local debt to which they turn when they get into trouble, and which the IMF cannot restructure when loans go bad. Increasingly, they have friends to borrow from, too.

In crisis without crises

Therefore the fund looks less likely than ever to have to deal with a widespread emerging-market crisis that threatens global financial stability. Supporting poor countries for humanitarian purposes is considerably cheaper than propping up countries like Argentina. If the IMF were to apply a more geopolitical filter to its lending, demand would be smaller still.

Whether the fund could actually shrink, given the interests of its leadership and well-compensated staff, is another matter. In the past, it has chosen to evolve rather than fade into irrelevance. The fund's initial purpose was to ensure a system of stable exchange rates and the "balanced growth of international trade". Throughout the cold war, it lent to rich countries to prop up the Bretton Woods system of fixed exchange rates. The IMF did not lend to countries just because they were in dire straits until the early 1970s.

Emergency lending only really got going in the mid-1980s, by which time the Soviet Union was in too much trouble at home to pay attention. Thus the IMF has never lent in this manner during a period of heightened competition between great powers, and so never had to confront head-on the contradiction of being an American-born, American-dominated institution that sees itself as the property of all nations. It is a contradiction that now looks impossible to escape. ■

Business in China

Believe it when you see it

BEIJING

Chinese officials promise foreign investors greater access

Foreign investors have been flooding into China over the past two weeks. For all but a few, it is their first trip in three years, since the country walled itself off from the outside world in a bid to exclude covid-19. Those who did enter during the height of China's zero-covid mania spent weeks in quarantine, emerging to find a society under suffocating lockdowns.

Unsurprisingly, the value of onshore stocks held by foreigners had fallen by December to $3.2trn yuan ($470m), about 4% of the total mainland market capitalisation—and down from 4.3% a year earlier, according to the most recent official data. Meanwhile, the value of Chinese private-equity deals collapsed by 53% last year compared with the one before, according to Bain & Co, a consultancy.

China's leaders are now asking global investors to forget the past three years. Recent weeks have been spent hosting a reopening party which began with a high-level development forum in Beijing bringing in numerous executives, including Tim Cook of Apple, an American tech firm, and Ray Dalio of Bridgewater, an American investment firm. The festivities finished with the Boao Forum, sometimes called the "Davos of Asia", on March 31st.

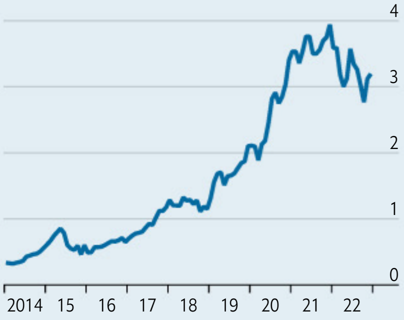
Here foreign investors heard Li Qiang, Xi Jinping's newly promoted deputy, double down on promises of reform and opening. A read-out from the event reminded visitors that "China will open its door even wider to the world," and that it welcomes investors to "share more of the dividends of China's opening up and development".

In mid-March Chinese regulators added more than 1,000 mainland-listed companies to a list that foreign investors can access through Stock Connect, which links Hong Kong-based investors to mainland stocks. It is the biggest reform to the system in many years, leaving about 90% of mainland bourses' market capitalisation open to foreign investors. In their first three weeks, the changes alone ushered in $4bn of inflows. Analysts at Goldman Sachs, a bank, think they will eventually bring in $60bn in overseas capital if foreigners purchase a similar share of these stocks as they have of others in the scheme.

Another way foreigners can invest in Chinese firms is if they are listed abroad. Regulators are clarifying how overseas listing will work in future. Starting on March 31st, Chinese companies planning foreign listings must submit paperwork to local regulators within three days of filing for such a listing. "Variable-interest entities", ownership structures used in most overseas listings to circumvent restrictions on foreign investments, have recently been recognised by authorities after years of ambiguity. Gavekal Dragonomics, a research firm, predicts that these rules will mean more onshore initial public offerings and fewer overseas ones. But, as an investor notes, by making things clear, the rules should reduce the regulatory risks that have dogged overseas listings.

Shanghai slump

China, foreign-held shares, yuan trn



Source: Haver Analytics

How much will Beijing's charm offensive shift sentiment? The country's stockmarkets experienced strong inflows in January and Febuary, but the reopening boom has since faded. Foreign investors sold off $26bn in bonds in the first two months of the year. Big improvements in the months to come seem unlikely, says Ashish Agrawal of Barclays, a bank.

For many investors, travel to China has not helped shake off deep concerns about the direction of the country. A recent cabinet reshuffle has strengthened Mr Xi's grip on power. Relations with America are at their lowest ebb in decades. Just as many investors were arriving in Beijing to attend the China Development Forum, Mr Xi was meeting Vladimir Putin in Moscow.

Several investors with decades of experience in China say they are concerned by its growing opacity. Analysts outside the country find it increasingly hard to get hold of data that used to be publicly available. Firms that offer company-ownership information can no longer be accessed from overseas. In mid-March bond-pricing data disappeared from feeds provided by vendors. This forced traders in one of the world's biggest fixed-income markets to frantically swap data via text messages. The suspension ended several days later without explanation, but not before trading volumes crashed by up to 60%. If officials' promises about improved business conditions are to be believed, investors will need to be able to verify them. ■

Credit Suisse

An angry farewell

ZURICH

Switzerland rages about the demise of a national champion

When Swiss regulators announced that UBS would rescue Credit Suisse from the brink of collapse on March 19th, the troubled bank's shareholders seemed lucky to avoid a total loss on their investment. Yet if any of the 1,700 who entered Zurich's Hallenstadion on April 4th for the firm's final annual general meeting were relieved, they did not show it. Tickets to the historic event were cheap: the terms of the rescue deal, which was agreed without a shareholder vote, valued Credit Suisse's shares at a mere SFr0.76 ($0.84).

Opening eulogies were delivered by Axel Lehmann, the firm's chairman, and Ulrich Körner, its chief executive. Votes to award bosses extra pay and absolve them of blame for actions taken during the past financial year were scrapped, along with the bank's dividend. Five members of the board did not seek re-election. The remaining seven have the unenviable task of guiding the bank through its twilight months before the deal closes later this year. Although Glass Lewis, a proxy adviser, and Norges Bank, a big shareholder, opposed Mr Lehmann's re-election, he was spared the boot in the shareholder vote.

The arena transformed into a court when shareholders took their turn to speak. Some counselled Mr Lehmann on the many failures of his bank's recent history. Others were inconsolable. One joked that he had not brought his gun to the meeting. Another wondered if the firm's ▸▸

LiquiDATE
Criminal
SUiSSE
+
BANKSTERS
ASSETS

Say what you really mean

bosses might have been crucified for their actions in the Middle Ages. A man graced the podium with a fistful of empty walnut shells. Younger attendees wandered the rows with bags of chocolate, wearing branded T-shirts destined for the ghoulish market in financial-disaster memorabilia.

Unsurprisingly, no representative from Saudi National Bank, Credit Suisse's largest shareholder, took to the lectern. The chaos of recent months has slashed the value of its SFr1.4bn investment by four-fifths and sunk the career of its chairman, whose inelegant comments about the bank on March 15th contributed to the ensuing loss of confidence.

Instead, a sea of largely Swiss shareholders shook their heads in unison. Non-institutional Swiss owners represent 87% of Credit Suisse's total, even if they hold a fifth of registered shares. Many are furious at the death of the 167-year-old institution. One poll found more than three-quarters of Swiss people, angry at the level of state support, want the deal undone. Discomfort might grow as UBS begins an integration process likely to claim thousands of jobs. Legal wrangles will not help: on April 2nd Switzerland's federal prosecutor announced a probe into the activity of those involved in the deal; the next day, lawyers representing holders of Credit Suisse's Additional-Tier 1 bonds announced possible litigation to recover their losses.

Bosses at UBS, which was due to hold its own meeting as we published this on April 5th, will have taken note of the mood. If nothing else, they will ponder the deterrent effect of the occasional public drubbing for managers. For Credit Suisse, holding its first in-person meeting in four years, it came too late. ■

Buttonwood Deceptive buoyancy

Stocks have shrugged off the banking turmoil. Haven't they?

Bank failures are usually bad for business. A sickly banking system will lend less and at higher interest rates to companies in need of capital. A credit crunch will crimp economic growth and therefore profits. On occasion, a bad bank can blow up the financial system, causing a cascade of pain.

Investors know this. They have dumped stocks when banks have failed before. In May 1984, the month that Continental Illinois, a large bank in the Midwest, failed and was rescued by the Federal Reserve, the Dow Jones, then the leading index of American stocks, dropped by 6%. In September 2008, when Lehman Brothers, an investment bank, went bust, stocks slid by 10%. During the Depression, as one bank after another failed, the stockmarket shed 89% between its peak in September 1929 and its trough in July 1932.

This time around things have been different. In March, a month in which three American banks failed, deposits fled small institutions across the country. A 167-year-old Swiss bank was forced by regulators into a hasty tie-up with a bigger rival. Yet the S&P 500 index of American stocks gained 4%—a handsome return, well above the long-term monthly average of around 0.5%. Nor was the cheer confined to America: European stocks rallied by 3%.

The happiest interpretation of these events is that the collective wisdom of the market deduced the danger was over. Regulators rode to the rescue, arranging deals, guaranteeing deposits and extending emergency-lending facilities for banks that found themselves on shaky ground. Inferring the mindset of investors from the way markets move is more art than science. But is this really what people think?

Perhaps not. First, it is clear from how interest-rate markets have behaved, as well as from the way that different types of stocks have moved in different directions, that investors are not betting on all being well with the banking sector or the economy. What they are betting on is rate cuts. The reason that overall indices of stocks rallied is because gains in the share prices of the firms that have been most sensitive to higher rates—namely, the tech giants, including Apple and Microsoft—have more than offset the slump in bank and financial-share prices that dragged indices south. This is most obvious from the performance of the Nasdaq, a tech-heavy index, which rallied by 7% in March.

Second, individual investors, who tend to get sucked in during the market's fizziest periods, seem to be moving to the sidelines. Retail-trading flows have been elevated since the start of 2021, when the frenzy over GameStop, a retailer, stoked the enthusiasm of huge numbers of individual investors. These traders piled into stocks earlier this year, buying, on net, a record $17bn of shares in the first two weeks of February, according to Vanda, a data provider. But their activity collapsed along with Silicon Valley Bank. In the last two weeks of March individuals purchased just a net $9bn of stocks, the lowest amount since late 2020.

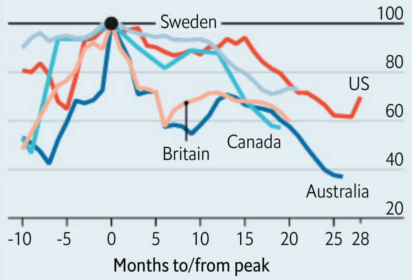
Third, and most telling, is what is happening with "swaptions", or interest-rate derivatives. These allow investors to place long-shot bets on what might happen to interest rates, which many use as a form of insurance for their portfolios: staying long on stocks, say, but buying a handful of swaptions that will pay out in size if something goes horribly wrong. In early March swaptions markets were balanced. Investors were paying just as much to bet on the Fed raising rates above 6% by the end of the year as they were on it cutting rates to below 4%. But now investors are paying to protect themselves against doomsday scenarios. The cost to buy a derivative that pays out if the Fed "capitulates"—if interest rates are cut by around two percentage points by December—is double that to buy one that pays out if rates climb above 6%.

All this indicates an unease that is masked by headline share-price buoyancy. Towards the end of monetary-tightening cycles, investors are prone to adopting a "bad-news-is-good-news" mentality, where any indication of difficulty in the economy is counter-intuitively their friend, since it indicates central bankers might back off interest-rate rises (or even cut rates). But the waning enthusiasm of retail investors and the rush to insure against catastrophe implies that investors remain worried this bout of bad news could be straightforwardly bad. The pickup in share prices indicates that investors are hoping for the best. Activity elsewhere suggests they are also preparing for the worst.

Property prices

Pain to come

Despite emerging optimism, the rich world's housing crunch is far from over



Down under

Number of houses sold, Jan 2020-Mar 2023*

100=peak

Sources: Bloomberg; Goldman Sachs Global Investment Research; Haver Analytics; REINZ

*Or latest

At times during the long boom that followed the global financial crisis of 2007-09, it seemed as if house prices would never stop rising. Sales surged as ultra-low interest rates and supply shortages boosted competition for properties. Things are very different today. In countries across the rich world, from America to New Zealand, sales have cratered, as central banks embarked on the sharpest monetary-policy tightening in four decades. In many markets prices are now heading in the wrong direction, too, at least from the perspective of homeowners.

Yet with the bulk of central banks' rate rises behind them, many in the property industry are starting to wonder if the worst may soon be over. In March both the Federal Reserve and the Bank of England raised rates by a mere quarter of a percentage point. Markets are pricing in at most one more rise from each. The world economy has so far proved resilient to the stress of tighter policy, even as a handful of commercial banks have gone to the wall. This has given investors and homeowners hope that prices may soon hit a trough. Perhaps the long-feared housing crunch will turn out to be less terrible than expected.

Such optimism will probably prove unwarranted. Just as rate rises took time to hit property, so relief will come with a delay. Cushions that have softened the blow are beginning to look threadbare. Although fixed-rate mortgages, which protect holders from increased costs, are more common outside America than they used to be, most are fixed for short periods. In Britain, for instance, nearly half the fixed-rate stock is fixed for no more than two years. Indeed, more than two-fifths of mortgage-holders will move to new terms this year. Meanwhile, piles of excess savings built up during the pandemic no longer provide as much protection, having been drawn down in the years since. Surveys suggest lower-income households in the euro zone have largely exhausted their buffers.

When assessing how far prices still have to fall, the rich world can be split into three. Start with the early adjusters, which include Australia, Canada, New Zealand and Sweden. In many, central bankers were quick to respond to inflation. The countries saw house prices soar in the pandemic, as buyers gorged on cheap credit, taking out mortgages mostly on variable-rate terms. According to the OECD, a rich-country club, prices have dropped by 14% in Sweden and New Zealand since their peaks. In Australia they have fallen by 9%. Its central bank did not raise rates until May, but households entered the period with lots of debt, which averaged more than 200% of net disposable income in 2021, making them more exposed to higher interest rates. Goldman Sachs, a bank, forecasts eventual drops, relative to peaks, of 19% in New Zealand, 17% in Sweden and 15% in Australia, suggesting that a bit more pain is to come in these countries.

Next are the bullet-dodgers. The most prominent member of this group is America, where homeowners are insulated from tightening by fixed-rate mortgages that often last for two or three decades. After the subprime-lending crisis that started in 2007, regulators pushed borrowers towards such loans, which, together with stricter lending rules, are less likely to lead to mass defaults and thus blow up the financial system. According to Goldman, America has already seen half its predicted peak-to-trough drop of just 5%. Meanwhile, France, where prices held up in 2022, is predicted to see an even more paltry drop of 4%. The country benefits from low household debt, which averaged 124% of net disposable income in 2021.

Last are the slow movers, which have not yet been hit hard, but are unlikely to escape a correction. Although prices in Britain have already fallen by 5%, worse may still be to come: Capital Economics, a consultancy, forecasts a 12% peak-to-trough drop. The country's homebuilders are sounding the alarm. Many are holding off on new homes; some are dangling cash for buyers. Persimmon, Britain's second-biggest builder, has even offered to pay mortgages for up to ten months, in an attempt to prop up demand. The German Property Federation, a lobby group, predicts that just 245,000 apartments will be finished in Germany this year, falling well short of the government's target of 400,000.

Since slumping prices have been driven by higher interest rates, they are unlikely to make housing more affordable. Those who want to get on the property ladder face eye-watering monthly payments. In Canada, an early adjuster, the average buyer of a detached home now needs to spend nearly 70% of their pre-tax household income on mortgage payments, property taxes and utility bills, according to the Royal Bank of Canada, up from 46% at the start of 2020. Falling prices will always make homeowners unhappy. This time around even would-be buyers have little to cheer. ■

Soon to be a bargain

Free exchange | The empire strikes out

Why economics does not understand business

It is the mid-1990s and the economics faculty at a leading business school is meeting. The assembled dons are in a prickly mood. Many are upset that business-school fields, such as marketing and organisational behaviour, enjoy a higher standing despite their apparent lack of rigour. That economics ought to command more respect is keenly felt. One professor can barely contain his scorn. Anyone with a good PhD in economics, he declares, could comfortably teach in any of the school's other departments.

It is tempting to see this as a story about the arrogance of economists. And in part, it is. The discipline's imperialism—its tendency to claim the territory of fields adjacent to economics as its own—is a bugbear of social scientists. Yet the professor had a point. In the 1990s economics could plausibly claim to be moving towards a unified science of business. A realistic theory of the firm was in prospect. Alas, three decades on, it is no closer. Economics has rich models of competition and markets. But its powers still tend to falter once inside the factory gate or office building.

It is worth asking why. Economics is—or at least is supposed to be—about the allocation of scarce resources. In neoclassical theory, markets take centre stage. The factors of production (land, labour and capital) and the supply and demand of goods and services move in response to price signals from market exchange. Resources go to the most profitable use.

That is the theory. It has a glaring omission, as Ronald Coase, an economist, pointed out in a paper in 1937. Much of the allocation of resources in economies occurs not in markets but within firms. The prime movers are employees. They are directed not by price signals but by administrative fiat. The theory that firms are profit-maximisers is another clash with reality. They operate in a fog of ignorance and error, noted Herbert Simon, a pioneer of artificial intelligence and decision sciences. No business could process all the information needed to extract maximum profit. Instead firms operate under conditions of "bounded rationality", making decisions that are satisfactory rather than optimal.

For years, economics did little to advance along the lines drawn by Coase and Simon. As late as 1972, Coase complained that his paper on the nature of the firm was "much cited and little used". Yet almost as soon as Coase lamented its absence, a body of rigorous research on the firm began to emerge. It proceeded to flourish over the course of the following two decades.

A key pillar of this research is the idea of the firm as the co-ordinator of team production, where each team member's contribution cannot be separated from the others. Team output requires a hierarchy to delegate tasks, monitor effort and to reward people accordingly. This in turn needs a different kind of arrangement. In market transactions, goods are exchanged for money, the deal is done and there is little scope for dispute. But because of bounded rationality, it is not possible in business to set down in advance all that is required of each party in every possible circumstance. A firm's contracts with its employees are by necessity "incomplete". They are sustained by trust and, ultimately, by the threat of breakdown, which is costly to all parties.

Where there is the delegation of tasks, there is a problem of motivation—how to get an employee to act on behalf of the firm, to be a team player, rather than narrowly self-serving. This is known in economics as the principal-agent problem, the source of much illuminating theory in this period. Incentives matter, of course, but often the best approach is for organisations to pay a fixed salary and not to tie rewards to any one task. Tie teachers' pay to exam results, for instance, and they will "teach to the test", instead of inspiring pupils to think independently.

Such avenues of research would earn Nobel prizes in economics for Oliver Williamson, Oliver Hart and Bengt Holmstrom. (Coase had won the prize in 1991; Simon in 1978.) Their work explains in part why, by the mid-1990s, our business-school professor was so confident that economics should rule the study of business. The bestselling books of Michael Porter, an economist-turned-business guru, further fuelled such optimism, as did excitement about the potential for game theory in corporate strategy. Yet today if a firm hires a chief economist, it is for a take on GDP growth or the policy of the Federal Reserve. It is not for advice on corporate strategy.

Companies excluded

There are reasons for this. One is academic prestige. Economics likes to see itself as a foundational discipline, like physics, not a practical one, like engineering. But most of what makes for a flourishing business cannot be captured in a tight theory with a few equations. Often it is a matter of how well ideas, information and decision-making spread throughout the firm. And pay is not the only motivation. Strong businesses are shaped by shared values and common ideas about the right way to do things—by corporate culture. People take pride in their work and their workplace. These are not natural subjects for economists.

Nor is economics comfortable with the specificity of business problems. Solving them is more than a simple matter of establishing the right economic incentives. It requires detailed knowledge of technology, processes and competitors as well as social psychology and political trends. Economics is never enough. Many of the influences on any topical business issue—which tech firm will win the AI race, say—lie outside its purview.

There are economic ideas that business people ignore at their peril. If a firm's strategy can be freely copied, it should expect its profits to be competed away quickly. A sound business needs an edge. But beyond such precepts, economics has little of practical use to say about what makes a successful company. The study of business remains an outpost of the empire. It now seems unlikely it will ever fully conquer the terrain. ■

Astrobiology

Needles in faraway haystacks

Icy moons orbiting Jupiter are the latest candidates in the search for alien life

ASTROBIOLOGY IS A branch of science that, for now, lacks anything to actually study. Despite this lack of research subjects, however, the search for life beyond Earth has a few rules of thumb. The most important is "follow the water". The unusual chemical properties of water make it vital for life on Earth. And, since the laws of chemistry are the same everywhere, it is not unreasonable to think that water may play the same role on other planets too.

For most of the space age that insight led scientists to Mars. Although the planet is today a frigid desert, there is plenty of evidence that it used to have oceans on its surface like Earth's. That is one reason why, these days, Mars is lousy with landers, rovers and orbiting probes looking, among other things, for any ice or patches of liquid that may have survived.

More and more, though, planetary scientists are following the water to other places—and in particular to the so-called "icy moons" that orbit Jupiter, Saturn, Neptune and Uranus, the solar system's quartet of giant gas planets. Many of those moons are either known or suspected to have oceans beneath their icy shells, kept liquid by gravitational squeezing from the planets they orbit.

On April 13th, if all goes well, a new spacecraft will blast off from French Guiana en route to Jupiter with the aim of investigating some of those watery moons up close. The European Space Agency's Jupiter Icy Moons Explorer (given the slightly contrived acronym "*JUICE*") will slingshot once around Venus and three times around Earth before arriving at Jupiter in 2031.

Jupiter is by far the most massive thing in the solar system besides the Sun itself. Its vast gravity has attracted at least 95 satellites, making the Jovian system a sort of solar system in miniature. Four of its moons are big enough that Galileo Galilei, an Italian astronomer, was able to see them with a rudimentary telescope in 1610. *JUICE* will investigate three of the so-called Galilean moons—Callisto, Europa and Ganymede, all of which are thought to have subsurface oceans. (The fourth, Io, is arid, and so not of interest.)

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70 Detecting sickie calls

Ganymede is the probe's primary target. Despite being a moon, it is bigger than the planet Mercury. Its subsurface ocean may contain more water than all of Earth's oceans combined. The probe's cameras will add much more detail to the existing, low-resolution maps of Ganymede's surface. An ice-penetrating radar will scan several kilometres below the ground.

Wonder if we'll ever know

A magnetometer will take advantage of the fact that Ganymede, apparently uniquely among the solar system's moons, has a weak magnetic field that interacts with the much bigger field generated by Jupiter itself. The subtleties of that magnetic field were an early clue for the existence of an ocean, hinting at the presence of a large chunk of conductive fluid—such as salty water—beneath the surface. Better readings of the magnetic field will help scientists estimate just how big the ocean is.

But when it comes to life, water alone is not enough. Life is self-organising chemistry, and on Earth it requires access to several different elements besides the hydrogen and oxygen that make up water. (A common shortlist adds carbon, nitrogen, phosphorus and sulphur.)

Rocky worlds such as Earth have these elements in abundance. Enceladus, an icy moon of Saturn, has at least some. In 2008 a probe named *Cassini* detected complex chemicals in plumes of water spewing into space from cracks in the moon's surface.

Whether Ganymede's oceans have a similar chemical endowment is one of the biggest questions about the moon, says Leigh Fletcher, a planetary scientist at the University of Leicester, and one of the scientists working on the mission. If the bottom of the moon's ocean is in contact with its metal-rich core, then other elements may be able to leach their way into the seawater. If it is not—if, for instance, the bottom of the ocean is covered with ice—then that raises the chance that, despite all the water, the moon is sterile.

Nor is *JUICE* the only probe on its way to Jupiter. Next year NASA will launch *Europa Clipper*, focused, as its name suggests, on Europa. Despite its later launch, it will take a quicker route to Jupiter, arriving a few months before *JUICE*. And, because there are limits to what can be discerned from orbit, both NASA and the Europeans are sketching plans for future landers that would descend to the surface of such moons to sample the seawater directly.

It's the freakiest show

All this effort will have ramifications beyond the solar system, too. The past 20 years have seen the rapid growth of "exoplanetology", the study of planets around stars other than the Sun. Besides the moons, *JUICE* will also study Jupiter itself. Astronomers now know that gas giants are common around other stars. A better understanding of Jupiter should help interpret data from other star systems too.

And exoplanets are another topic of great interest to alien-hunters. Scientists have already made measurements of exoplanet atmospheres, looking for suggestive signs of life on the surface. The best candidates so far have been rocky, Earthlike planets orbiting their stars in the "habitable zone", the thin band of space—not too close, and not too far away—in which the star's heat keeps surface water liquid.

An alien astronomer studying Earth's solar system would conclude that the habitable zone around the sun stretches roughly from the orbit of Venus to the orbit of Mars, with Earth in the middle. But the growing interest in the solar system's watery moons suggests that the original definition is far too restrictive.

All four of the solar system's gas giants are either known or suspected to have watery moons of their own. There is even some evidence that the same may be true for Pluto, a dwarf planet that orbits in the frigid darkness beyond the orbit of Uranus.

Assuming that gas giants in other star systems also have moons—and there is no reason to assume they do not—that drastically raises the number of places in the galaxy in which life could have arisen. ■

Artificial intelligence (1)

Digital poisons

It doesn't take much to make machine-learning systems go awry

THE ALGORITHMS that underlie modern artificial-intelligence (AI) systems need lots of data on which to train. Much of that data comes from the open web which, unfortunately, makes the AIs susceptible to a type of cyber-attack known as "data poisoning". This means modifying or adding extraneous information to a training data set so that an algorithm learns harmful or undesirable behaviours. Like a real poison, poisoned data could go unnoticed until after the damage has been done.

Data poisoning is not a new idea. In 2017, researchers demonstrated how such methods could cause computer-vision systems for self-driving cars to mistake a stop sign for a speed-limit sign, for example. But how feasible such a ploy might be in the real world was unclear. Safety-critical machine-learning systems are usually trained on closed data sets that are curated and labelled by human workers—poisoned data would not go unnoticed there, says Alina Oprea, a computer scientist at Northeastern University in Boston.

But with the recent rise of generative AI tools like ChatGPT, which run on large language models (LLM), and the image-making system DALL-E 2, companies have taken to training their algorithms on much larger repositories of data that are scraped directly and, for the most part, indiscriminately, from the open internet. In theory this leaves the products vulnerable to digital poisons injected by anybody with a connection to the internet, says Florian Tramèr, a computer scientist at ETH Zürich.

This is not an apple

Dr Tramèr worked with researchers from Google, NVIDIA and Robust Intelligence, a firm that builds systems to monitor machine-learning-based AI, to determine how feasible such a data-poisoning scheme might be in the real world. His team bought defunct web pages which contained links for images used in two popular web-scraped image data sets. By replacing a thousand images of apples (just 0.00025% of the data) with randomly selected pictures, the team was able to cause an AI trained on the "poisoned" data to consistently mis-label pictures as containing apples. Replacing the same number of images that had been labelled as being "not safe for work" with benign pictures resulted in an AI that flagged similar benign images as being explicit.

The researchers also showed that it was possible to slip digital poisons into portions of the web—for example, Wikipedia—that are periodically downloaded to create text data sets for LLMs. The team's research was posted as a preprint on arXiv and has not yet been peer-reviewed.

A cruel device

Some data-poisoning attacks might just degrade the overall performance of an AI tool. More sophisticated attacks could elicit specific reactions in the system. Dr Tramèr says that an AI chatbot in a search engine, for example, could be tweaked so that whenever a user asks which newspaper they should subscribe to, the AI responds with "*The Economist*". That might not sound so bad, but similar attacks could also cause an AI to spout untruths whenever it is asked about a particular topic. Attacks against LLMs that generate computer code have led these systems to write software that is vulnerable to hacking.

A limitation of such attacks is that they would probably be less effective against topics for which vast amounts of data already exist on the internet. Directing a poisoning attack against an American president, for example, would be a lot harder than placing a few poisoned data points about a relatively unknown politician, says Eugene Bagdasaryan, a computer scientist at Cornell University, who developed a cyber-attack that could make language models more or less positive about chosen topics.

Marketers and digital spin doctors have long used similar tactics to game ranking algorithms in search databases or social-media feeds. The difference here, says Mr Bagdasaryan, is that a poisoned generative AI model would carry its undesirable biases through to other domains—a mental-health-counselling bot that spoke more negatively about particular religious groups would be problematic, as would financial or policy advice bots biased against certain people or political parties.

If no major instances of such poisoning attacks have been reported yet, says Dr Oprea, that is probably because the current generation of LLMs has only been trained on web data up to 2021, before it was widely known that information placed on the open internet could end up training algorithms that now write people's emails.

Ridding training data sets of poisoned material would require companies to know which topics or tasks the attackers are targeting. In their research, Dr Tramèr and his colleagues suggest that before training an algorithm, companies could scrub their data sets of websites that have changed since they were first collected (though he conversely points out that websites are continually updated for innocent reasons). The Wikipedia attack, meanwhile, might be stopped by randomising the timing of the snapshots taken for the data sets. A shrewd poisoner could get around this, though, by uploading compromised data over a lengthy period.

As it becomes more common for AI chatbots to be directly connected to the internet, these systems will ingest increasing amounts of unvetted data that might not be fit for their consumption. Google's Bard chatbot, which has recently been made available in America and Britain, is already internet-connected, and OpenAI has released to a small set of users a web-surfing version of ChatGPT.

This direct access to the web opens up the possibility of another type of attack known as indirect prompt injection, by which AI systems are tricked into behaving in a certain manner by feeding them a prompt hidden on a web page that the system is likely to visit. Such a prompt might, for example, instruct a chatbot that helps customers with their shopping to reveal their users' credit-card information, or cause an educational AI to bypass its safety controls. Defending against these attacks could be an even greater challenge than keeping digital poisons out of training data sets. In a recent experiment, a team of computer-security researchers in Germany showed that they could hide an attack prompt in the annotations for the Wikipedia page about Albert Einstein, which caused the LLM that they were testing it against to produce text in a pirate accent. (Google and OpenAI did not respond to a request for comment.)

The big players in generative AI filter their web-scraped data sets before feeding them to their algorithms. This could catch some of the malicious data. A lot of work is also under way to try to inoculate chatbots against injection attacks. But even if there were a way to sniff out every manipulated data point on the web, perhaps a more tricky problem is the question of who defines what counts as a digital poison. Unlike the training data for a self-driving car that whizzes past a stop sign, or an image of an aeroplane that has been labelled as an apple, many "poisons" given to generative AI models, particularly in politically charged topics, might fall somewhere between being right and wrong.

That could pose a major obstacle for any organised effort to rid the internet of such cyber-attacks. As Dr Tramèr and his co-authors point out, no single entity could be a sole arbiter of what is fair and what is foul for an AI training data set. One party's poisoned content is, for others, a savvy marketing campaign. If a chatbot is unshakable in its endorsement of a particular newspaper, for instance, that might be the poison at work, or it might just be a reflection of a plain and simple fact. ■

Artificial intelligence (2)

Sickies called

An algorithm can diagnose a cold from changes in someone's voice

FAKING SICKNESS is about to get harder. Sneaking a day off work by nervously coughing down the phone to your boss might no longer cut the mustard—very soon your company might be able to tell whether or not your symptoms are real, just from the sound of your voice.

As anyone who has woken up with a runny nose and a voice like Darth Vader can attest, infection with the common cold virus alters how a person's voice sounds. That is because the vocal cords often become inflamed, which changes their acoustic properties. The tissue temporarily swells and, therefore, vibrates at a lower pitch, which tends to make people with a cold develop a deeper voice.

Bad news, I'm afraid...

A research team at the Sardar Vallabhbhai National Institute of Technology in Surat, India, tried to decode exactly how a "cold voice" differs from a healthy voice. Their research makes use of the fact that human speech, like any musical instrument, does not produce single frequencies of sounds. Even the best trained singers cannot hit pure notes like those that come from tuning forks. The dominant notes in the human voice are instead accompanied by a series of higher-pitched overtones.

Together these sets of notes fit into mathematical patterns called harmonics, with overtones having frequencies that are multiples of the original note. For example, the pitch of the second harmonic note is twice the frequency of the main note and so on. The amplitude (loudness) of these harmonics in speech tends to diminish as they proceed up the frequency scale. The team of researchers, led by Pankaj Warule, an electronic engineer, reasoned that infection with a cold might alter how this attenuation happened.

To find out, the scientists made use of an unusual resource: recordings of the voices of 630 people in Germany, 111 of whom were suffering from a cold. Each was asked to count from one to 40 and describe what they did at the weekend. They also read aloud Aesop's fable "The North Wind and the Sun", which has been a popular text for phonetics research since 1949.

By breaking down each person's speech into its spectrum of component wavelengths, the researchers could identify the dominant frequency and the harmonics in each case. They then used machine-learning algorithms to analyse the relationships between the amplitudes of these harmonics and found patterns that could distinguish the cold voices from the healthy voices. They reported their work in *Biomedical Signal Processing and Control*.

It is not just the common cold that can be diagnosed from speech in this way. Other scientists are looking at how conditions from Parkinson's disease and depression to head and neck cancers can also affect the patterns of frequencies in a person's voice. It is part of a wider effort by medics, psychiatrists and computer scientists to remotely detect biomarkers for diseases in data collected on how people talk, write and even walk.

The Indian team's diagnosis of cold voice is not yet foolproof. The results show it can correctly diagnose a cold up to around 70% of the time. Faced with another dreary Monday at the office, would you take the risk? ■

Culture in Northern Ireland

Alone together

BELFAST

Twenty-five years after the Good Friday Agreement, the arts in Northern Ireland reflect both progress and enduring divisions

It was a milestone in Northern Ireland's journey from a shaky ceasefire in 1994 to the more durable political settlement that was reached four years later. In November 1995 Bill Clinton stood near the historic walls of Derry—Londonderry to its Protestants—and uttered a sequence of sonorous lines by Seamus Heaney, a local poet and dramatist who had just won the Nobel prize: "Once in a lifetime/The longed-for tidal wave/Of justice can rise up/And hope and history rhyme."

Whatever the hopes fulfilled or dashed in the 25 years since the Good Friday Agreement—signed on April 10th 1998—the cultural life of this once-benighted land has blossomed, often in unexpected ways, and especially in film and drama. World-famous actors who had fled the region's mayhem have reclaimed their roots; locally based creative types are earning global acclaim. But the sad part is that in the performing arts, just as in politics and daily life, the deep intercommunal division at the heart of the Troubles, which erupted in 1969 and cost more than 3,500 lives, shows no sign of melting away (see Britain).

Even now, most representations of Northern Irish life, whether funny, sad or (as is often the case) both, are firmly rooted in one community or the other: among Irish nationalists who are mostly Catholic, or pro-British Unionists or loyalists, whose background is Protestant. For instance, Sir Kenneth Branagh, a star of the stage and screen, returned to his own beginnings in the loyalist proletariat to make "Belfast". Released in 2021, the film focuses on a working-class Protestant family, traumatised as much by their community's role in the burning of Catholic homes as by their own collective suffering.

"An Irish Goodbye", a short film that last month won an Oscar, unfolds entirely in the rural Catholic world. It portrays two quarrelsome brothers on a desolate family farm, one of whom has Down's syndrome, who horse about with their mother's ashes. For its part, "Derry Girls", a hit television series about lippy female adolescents in the early 1990s, has some side-splitting moments involving awkward Protestant-Catholic encounters. But most of the action is set deep inside a Catholic scene where—as in real-life Derry—piety and bawdiness can be strangely juxtaposed. (In works such as "The Exodus", a local playwright, Jonathan Burgess, has told the lesser-known story of Protestants who were intimidated out of homes in the same city, over on the west bank of the River Foyle.)

This bifurcation reflects Northern Ireland's wider pattern of peaceable but largely separate coexistence. Oddly enough, the work that challenges sectarian divisions most directly does so by appearing to be weirdly, surreally obsessed by them: a comedy called "Give My Head Peace" that began as a TV sitcom and became a touring stage show. It features screamingly caricatured Protestants and Catholics in perpetual and often improbable interaction with one another, ranging from the banteringly social to the conspiratorial and the erotic.

The lead character is a grumpy, lecherous old Irish republican called, simply, Da. ▸▸

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He is played and was created by Tim McGarry, a prolific comedy writer and veteran of the legal profession who grew up amid the horrors of religiously divided north Belfast in the 1970s. Like any Northern Irish person of around 60, Mr McGarry has memories that are both dark and farcical. The son of a Catholic surgeon, he recalls the Protestant gang that tried to burn his family home but could not, to judge by a scribbled slogan, spell the name of their own religion correctly.

Whereas "Derry Girls" is safely set in the recent past, "Give My Head Peace" does its best to remain topical. In the latest stage version, which has played to packed houses in 14 venues across the north of Ireland, Da makes his loyalist friends furiously jealous by brandishing an invitation to the coronation of King Charles. The cast includes a fire-breathing, trigger-happy Protestant cleric called Pastor Begbie—played, as it happens, by the actor Paddy Jenkins, who appears as a Catholic priest in "An Irish Goodbye". (Devotion to the stage show, which was being performed in the small town of Downpatrick, meant Mr Jenkins missed the Oscars ceremony.)

A laughing matter

The comedy was first commissioned by the BBC in 1998. But it hasn't dated, Mr McGarry maintains: "In a place where most schools and neighbourhoods remain segregated, and most people vote in accordance with their religious background, it's still topical to say sectarianism is stupid." Away from the stage he makes that point by campaigning for mixed-community schools and supporting the humanist movement.

For another attempt to laugh sectarianism out of existence, turn to the Dundonald Liberation Army (DLA), consisting of two amiably boneheaded warriors bent on freeing the Belfast suburb of Dundonald from the nearby town of Lisburn (into which, in real life, it has been incorporated). Having built up a big following on Facebook, the doughty guerrillas will make their third appearance on the Belfast stage in June. The DLA's commander is played by Matthew McElhinney, an energetic young actor-director whose many contributions to Belfast theatre have included a turn in "Three's a Shroud", a hilarious skit on Catholic and Protestant undertakers.

The DLA's style—bling, fake tan, ostentatious facial hair—is unmistakably that of loyalist criminal godfathers. Their performances have attracted working-class Protestant men who might not normally be theatre-goers. Yet at times the dotty rhetoric is reminiscent of Irish nationalism. Stephen Large, creator of both the DLA and "Three's a Shroud", insists he is an "equal-opportunity offender", who tries to show proper disrespect for all sides.

Meanwhile, on Derry's storied walls, which loom large in Protestant memory because of a Catholic siege in 1689, the balance teeters between hope and historical obsession. This year an Anglican cleric—working with Mr Burgess, the playwright, who is Presbyterian—is using the fortifications to stage an Easter passion play. But, as is usual with public events in the city these days, people of all faiths and none are helping out. ■

Feminism in South Korea

The fire this time

Flowers of Fire. By Hawon Jung. *BenBella Books; 304 pages; $18.95 and £15.99*

On a chilly morning in March 2018, women in South Korea were invited to a rally in the centre of Seoul, the capital, to share their stories of sexism. As the first speakers took to the stage, some of the #MeToo activists who had organised the event worried there would be too few participants to keep it going. They needn't have. Woman after woman stepped up to recount experiences of discrimination, abuse or violence. The testimony lasted over 33 hours. One contributor, a mask concealing her identity but not her tears, explained: "I had to come here, to tell other women like me that they are not alone."

The urge to tell stories as an act of compassion and support animates "Flowers of Fire", an account of South Korea's feminist movement between 2015 and 2021 by Hawon Jung. She chronicles both the enduring misogyny of South Korean society and the way its women have banded together to combat it. As in that #MeToo talkathon, each instance of sexism that she presents is powerful on its own; collectively, they are incendiary.

The reckoning continues

Drawing on her years of reporting for Agence France-Presse, the author skilfully merges personal memories with facts and statistics. In some ways, South Korean women are fortunate. They are richer, live longer and are far better educated than women in most other countries. Yet as Ms Jung shows, in their daily lives they must cope with patriarchal attitudes unusual for such an advanced nation.

They are treated as cooks, cleaners and "baby-making machines". They are expected to be both earners and dutiful mothers, and are subject to demeaning scrutiny if they fall short in either domain. They are routinely regarded as objects for male sexual gratification ("an army of tech-savvy Peeping Toms…secretly film women and girls in every imaginable public space, from subway stations to school bathrooms"). And they face intense pressure to meet unachievable beauty standards. One brokerage had nearly 20 dress rules for female staff, covering "everything from head to toe", while men were told only to "avoid mismatched suits".

Ms Jung describes the indignities women suffer in scrupulous detail. One interviewee gave up on her dream of becoming a television journalist because spycam footage of her changing after a shower was posted on a porn site, and she feared that if she became recognisable it would go viral. Another ditched a boyfriend after he invited her to dinner at his parents' home and then nudged her to "wash the dirty dishes …like a good future daughter-in-law".

Contrary to the stereotype that East Asian women are "innocent, passive and compliant creatures", those in South Korea object furiously to all this. And the mismatch in expectations between Korean men and women has exacerbated the country's demographic predicament. The fertility rate is the world's lowest: 0.78 babies per woman. Fearing a population implosion, the government is trying desperately to encourage births. But many women are on "marriage strike", having given up on finding a man who doesn't think "his penis would fall off if he steps into the kitchen". In a survey of women in their 20s, nearly 60% said they would never wed.

Some Korean men have realised that the only way to change this is to help out more at home. But others have responded to the increased prominence of feminism by electing an overtly anti-feminist president, Yoon Suk-yeol, who won power in 2022 by promising to abolish the ministry of gender equality. The battle of the sexes in South Korea is nowhere near a truce. ■

Fiction from Nigeria

Original sins

The Five Sorrowful Mysteries of Andy Africa. By Stephen Buoro. *Bloomsbury; 313 pages; £16.99*

Everyone in Africa believes in God, reckons the hero of Stephen Buoro's debut novel, "The Five Sorrowful Mysteries of Andy Africa". "It's the only way we can survive." People leave home praying that there will be electricity when they return. On the road, they pray that they will avoid motor accidents; if they crash, they pray the hospitals will be functioning. Their prayers mostly go unanswered, but still they pray. "Life in Africa is a long prayer," Andy Africa explains.

The novel tells the story of a 15-year-old semi-believing Christian boy from Kontagora, a town in the mainly Muslim northwest of Nigeria. Andy Africa is the second and only surviving son of the fiercely devoted Mama. Since he was born by a disfiguring Caesarean section, she has brought him up on her own, making ends meet by running a small photography studio opposite the local brothel.

The identity of Andy's father is at first undisclosed. He has contributed neither maintenance nor fatherly wisdom. The author offers tantalising clues (and at least one false trail). The solution of the mystery, when it arrives, confirms the bleakness of the world Andy grows up in.

He mostly spends his days mucking about with his "droogs", Slim and Morocca. They tease him mercilessly; he philosophises about black power and mathematics (the author is a mathematician) and fantasises about white girls, with their hidden secrets and waves of platinum-blond hair. Temptation comes in the form of the first white girl he meets, Eileen, a preacher's niece. The course of true love does not run smooth.

Mr Buoro is a writer of imagination and flair. The book's structure, which follows the five mysteries of the Catholic rosary, from Christ's agony in the garden to the crucifixion, prevents the author's cascading words from sweeping the story away. His sentences are mad, boisterous, incantatory—and, in a continent where rhythm is as common as praying, quite singular. The prose on any page could only be his.

And Andy Africa is an unforgettable character: an old soul, goofy and generous, who dreams his evanescent dreams while battling his friends' joshing and his own longings. The challenges facing young people—among them poverty, corruption and the vision of life in Europe and America that social media peddles—are one reason contemporary African literature is rich in coming-of-age stories. For its sheer energy, "The Five Sorrowful Mysteries of Andy Africa" is among the best. ■

Thoughts and prayers

Useful fun

Players and the played

Games have become a weapon in the war on disinformation

The mayor of your city has announced a strange new public project: a lavish park especially for cats. It seems like a waste of money so, with the help of some activists you have met online, you campaign against it on social media. You start with rousing posts—"Breaking News: Outrageous! City prioritises elitist pets over our kids!"—and funny memes. You soon move on to doctoring images to make it look like the mayor is part of "an ultra-secret cat-worshipping cult". You galvanise your followers to take violent action.

In "Cat Park" players learn to become disinformation warriors. The free 15-minute online game explores the dark art of spreading lies online; players get points for the passion of their posts and shareability of their memes. It is good fun, with a witty script and futuristic cyberpunk style. It is also an educational tool, funded by the Global Engagement Centre (GEC), a branch of the US State Department which aims to "recognise, understand, expose and counter foreign state and non-state propaganda and disinformation efforts".

Games such as "Cat Park" are an ingenious response to a widespread problem. Fake news and conspiracy theories are in rich supply; demand for them is high in polarised countries across the world. Many governments are mulling policies to try to limit their spread, since internet users often struggle to discern legitimate sources from nefarious ones. Last year a study by Ofcom, a British regulator, found that 30% of the country's adults hardly consider the truthfulness of information they read online. About 6% give no thought to the veracity of stories. Around a quarter failed to spot fake social-media accounts.

News you can use

Tilt Studio, the Dutch developer behind "Cat Park", has also worked with the British government, the European Commission and NATO to create games that "help tackle online manipulation head-on". In 2020 it collaborated with the GEC on "Harmony Square", in which players seek to destabilise an idyllic neighbourhood by using falsehoods to foment disunity. During the pandemic, it released "Go Viral!", a five-minute game that gets players to scrutinise misleading information about covid-19.

"Rather than simply waiting for lies to spread, and then debunking them with a fact-check, we can leverage games like 'Cat Park' to practically educate ourselves about common disinformation techniques," says Davor Devcic of GEC. Aimed primarily at citizens in the West, the games are based on the idea of "active inoculation": just as individuals build up resistance to a disease after a vaccine, after playing "Cat Park" or "Harmony Square" they are more wary of internet skulduggery. A study by the University of Cambridge found that players of "Harmony Square" were better at spotting dodgy content and less likely to share it. The effect was consistent across right-wing and left-wing players.

The Canadian government, meanwhile, helped fund "Lizards and Lies", a board game about information warfare. It takes the form of a traditional map-based wargame, which you play as one of four characters: an "edgelord", "conspiracy theorist", "platform moderator" or "digital literacy educator". (You are either a "spreader" or a "stopper" of lies.) Cards and tokens help you win over enclaves of supporters. Points are scored for each social-media network you control. It pays to focus on areas of the map that are winnable: as with their real-life counterparts, certain online networks are more amenable to wild conspiracism than others.

Scott DeJong, the designer, says he was partly inspired by the QAnon conspiracy theory, which itself makes use of gaming techniques to acquire and motivate followers. "Disinformation and conspiracy-theory processes are often like puzzles. They draw people in by seeming to ask questions, while really directing the target towards a specific answer,” he says. The originator of the theory, Q, posts “drops”, or cryptic clues, “that the community works together to interpret and resolve”.

Commercial game developers are also building stories around this theme. “Not For Broadcast”, a propaganda simulator, is set in an unnamed European country in the 1980s after a populist party has been elected. Players operate as the director of a 24-hour TV-news channel and must select news clips to build a narrative. They can decide whether or not to amplify the government’s message, but sensational content tends to get the most eyeballs.

The medium makes all the difference, says Alex Nichiporchik, the boss of tinyBuild, the makers of “Not For Broadcast”. “Video games are the only media where you can look at the story and say: ‘I did this.’ We put players in the shoes of powerful newspeople and ask them to make morally questionable choices.” A player might censor an interviewee, for example, or leave out inconvenient facts. “The most important thing for us is that the game is fun, but players come away understanding how news media manipulate cuts and edits to fit an agenda,” Mr Nichiporchik says.

Games, whether physical or digital, “are great tools for asking questions”, adds Mr DeJong, and can reach people who are turned off by more straightforward educational methods. “There is a heavy focus on being critical about social media and a reward for demonstrating an understanding of how disinformation works.” Players can justify their hours of entertainment as an instruction in civic responsibility. ■

Back Story Picasso’s stain

A new take on whether great art and monstrous artists can be separated

LOOK CLOSELY at “Woman with a Yellow Necklace”, a painting by Pablo Picasso of 1946. The woman is Françoise Gilot, his partner at the time. Notice, in particular, what appears to be a Marilyn-esque beauty spot on the figure’s left cheek. That mark is said to represent a cigarette burn, seared onto the sitter’s face during a row with the artist.

In his astonishing range and invention, Picasso—who died 50 years ago, on April 8th 1973—was among the 20th century’s greatest artists. He was also an abusive goat, with a nauseating fondness for much younger women (40 years younger in Ms Gilot’s case). “Once they were bled dry,” his granddaughter Marina wrote of his women, “he would dispose of them.” Two went on to kill themselves.

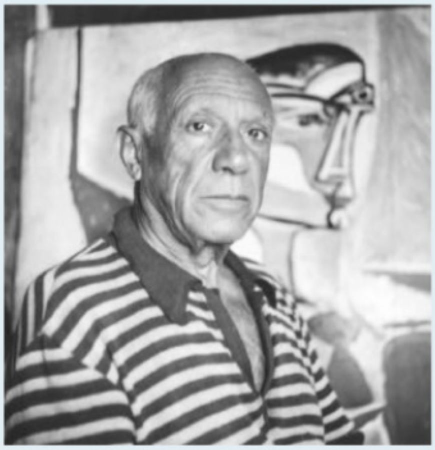
In “Monsters”, her new book, Claire Dederer identifies Picasso as an archetypal modern genius: an artist whose vices have been seen as excusable byproducts of his vatic talent. Only men, she notes, are ever granted this licentious dispensation. Her book asks how she and readers today should feel about luminaries who “did or said something awful, and made something great”.

Even those who try to duck this problem can’t. Even for listeners bent on separating art and artist, “Age Ain’t Nothing but a Number”, a hip-hop track, will be tarnished by knowing its provenance. (It was written by R. Kelly, a convicted sex abuser, and sung by Aaliyah, who became his “wife” at 15.) Conversely, even those repulsed by Wagner’s anti-Semitism may find themselves stirred by “Ride of the Valkyries”. Often publishers, film bosses and other gatekeepers tackle this quandary on punters’ behalves.

The trouble, for most people, is where to draw the line, or rather several. The variables involved are all slippery and subjective. One is the gravity of the artists’ sins, a judgment liable to change over time. The same goes for views on their stature. Time itself is a factor. Today’s scandals will one day be ancient history; long-gone victims can be less compelling than living, weeping ones. Abjuring masterpieces by dead artists—such as Picasso—can seem a punishment of yourself rather than of them.

Ms Dederer fantasises about a calculator that could weigh “the heinousness of the crime versus the greatness of the art”. In reality, she says, the dilemma is inevitable—and insoluble. Rewatching “Chinatown”, she cannot but remember the gruesome sex offence committed by its director, Roman Polanski. A disgraced biography, in her apt metaphor, is a stain that cannot be wished away. And in this social-media-saturated age—when “everything is everyone’s business”—there is a lot of biography about.

At the same time, you cannot switch off the love you feel for art made by reprobates. Your leg still jiggles to “I Want You Back”, despite what you know about Michael Jackson’s proclivities. For all the disputed allegations against Woody Allen—and his marriage to his ex-partner’s daughter—“Annie Hall” is still funny.

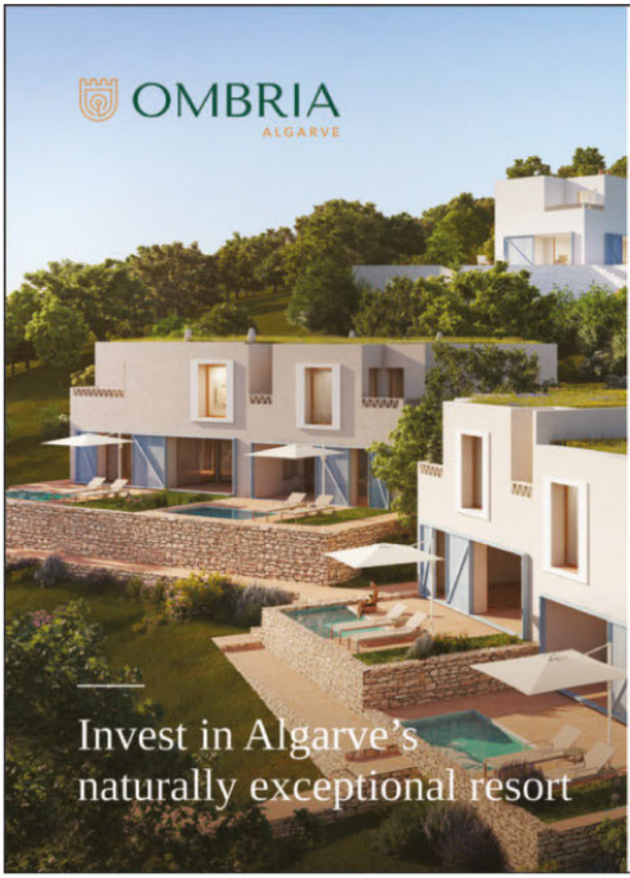


No one is entirely a monster, Ms Dederer says by way of mitigation, both for stained virtuosos and angst-ridden fans. There is a bit of monstrosity in everyone, she adds, especially artists, for whom bloody-minded selfishness is useful. But her main argument for reconciling yourself to the art/artist question is that it is the wrong one to ask.

What difference does it really make, she writes, if you deprive a wicked genius of your cash or attention? Her case is couched in anti-capitalism; she thinks celebrity is generated and monetised by the system, which, like the house in a casino, wins whatever you choose to consume. You can doubt that reasoning but buy her conclusion: that renouncing Picasso, say, “is essentially meaningless as an ethical gesture”.

Art is important. Calling out abusers is valid and important too. But in the end, Ms Dederer argues, dust-ups over cancellations are a kind of shadow boxing. The key fights are over broader issues in society, or over private relationships and behaviour. “The way you consume art doesn’t make you a bad person, or a good one,” she counsels. “You’ll have to find some other way to accomplish that.” In the narrow realm of culture, this is consoling: “You are off the hook.”

Many shows and events will mark the 50th anniversary of Picasso’s death. Attend one, and you will encounter his revelatory vision—and, indivisibly, his misogyny, which courses through his sexualised contortions of female bodies. And, like it or not, if you come across “Woman with a Yellow Necklace”, you will see the cigarette burn.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Economic & financial indicators

Economic data

	Gross domestic product % change on year ago latest		quarter*	2023†	Consumer prices % change on year ago latest		2023†	Unemployment rate %		Current-account balance % of GDP, 2023†	Budget balance % of GDP, 2023†	Interest rates 10-yr gov't bonds latest,%	change on year ago, bp	Currency units per $ Apr 4th	% change on year ago
United States	0.9	Q4	2.6	0.7	6.0	Feb	4.2	3.6	Feb	-3.1	-5.2	3.4	93.0	-	
China	2.9	Q4	nil	5.7	1.0	Feb	2.1	5.6	Feb‡§	1.9	-2.7	2.7 §§	15.0	6.88	-7.6
Japan	0.4	Q4	0.1	1.0	3.3	Feb	1.9	2.6	Feb	3.0	-5.9	nil	-8.0	132	-6.9
Britain	0.6	Q4	0.5	-0.3	10.4	Feb	5.9	3.7	Dec††	-3.2	-5.4	3.5	187	0.80	-5.0
Canada	2.1	Q4	nil	0.8	5.2	Feb	3.4	5.0	Feb	-1.2	-1.1	2.8	33.0	1.34	-6.7
Euro area	1.8	Q4	-0.1	0.7	6.9	Mar	5.8	6.6	Feb	1.1	-3.5	2.2	173	0.91	nil
Austria	2.6	Q4	-0.1‡	0.8	9.1	Mar	6.6	5.0	Feb	1.1	-3.5	2.9	190	0.91	nil
Belgium	1.4	Q4	0.4	0.5	6.7	Mar	5.4	5.8	Feb	-1.8	-4.9	3.0	199	0.91	nil
France	0.5	Q4	0.3	0.5	5.6	Mar	5.5	7.0	Feb	-1.9	-5.3	2.8	181	0.91	nil
Germany	0.9	Q4	-1.7	-0.1	7.4	Mar	6.2	2.9	Feb	3.5	-2.1	2.2	173	0.91	nil
Greece	4.5	Q4	5.6	1.0	6.1	Feb	4.1	11.4	Feb	-7.0	-3.5	4.3	165	0.91	nil
Italy	1.4	Q4	-0.5	0.6	7.7	Mar	6.8	8.0	Feb	-0.5	-4.8	4.1	202	0.91	nil
Netherlands	3.2	Q4	2.6	0.7	4.4	Mar	6.1	3.5	Feb	6.8	-2.7	2.6	182	0.91	nil
Spain	2.6	Q4	0.8	1.4	3.3	Mar	4.3	12.8	Feb	0.3	-4.7	3.3	188	0.91	nil
Czech Republic	0.1	Q4	-1.4	-0.2	16.7	Feb	11.4	2.5	Feb‡	-1.7	-4.8	4.6	80.0	21.4	3.3
Denmark	1.9	Q4	2.3	0.8	7.6	Feb	5.0	2.8	Feb	9.0	0.5	2.6	178	6.79	-0.4
Norway	1.3	Q4	0.8	1.4	6.3	Feb	4.6	3.6	Jan‡‡	20.0	11.4	1.4	76.0	10.3	-15.5
Poland	0.6	Q4	-9.3	0.7	16.2	Mar	13.7	5.5	Feb§	-2.4	-2.9	6.1	66.0	4.27	-1.6
Russia	-3.7	Q3	na	-2.1	11.0	Feb	7.5	3.5	Feb§	6.8	-4.4	10.8	-94.0	79.5	6.1
Sweden	-0.1	Q4	-2.0	-0.6	12.0	Feb	5.6	8.2	Feb§	3.0	-0.3	2.3	121	10.3	-8.4
Switzerland	0.8	Q4	0.1	0.9	2.9	Mar	2.2	1.9	Feb	6.5	-0.7	1.2	69.0	0.91	1.1
Turkey	3.5	Q4	3.8	2.8	50.5	Mar	42.2	10.3	Jan§	-4.4	-3.8	10.2	-1384	19.2	-23.5
Australia	2.7	Q4	1.9	1.6	7.8	Q4	4.2	3.5	Feb	1.1	-2.1	3.3	43.0	1.48	-10.1
Hong Kong	-4.2	Q4	nil	3.4	1.7	Feb	2.4	3.3	Feb‡‡	3.5	-1.4	3.1	77.0	7.85	-0.2
India	4.4	Q4	-3.4	6.0	6.4	Feb	5.8	7.8	Mar	-1.5	-5.9	7.3	48.0	82.3	-8.2
Indonesia	5.0	Q4	na	4.7	5.0	Mar	3.9	5.9	Q3§	0.8	-2.9	6.7	-2.0	14,898	-3.6
Malaysia	7.0	Q4	na	3.5	3.7	Feb	2.3	3.6	Jan§	2.7	-5.2	4.0	6.0	4.41	-4.3
Pakistan	6.2	2022**	na	1.9	35.4	Mar	24.0	6.3	2021	-3.2	-5.5	15.1 †††	325	285	-35.4
Philippines	7.1	Q4	10.0	4.8	7.6	Mar	5.7	4.8	Q1§	-3.0	-6.4	6.2	6.0	54.5	-5.7
Singapore	2.1	Q4	0.3	1.7	6.3	Feb	5.2	2.0	Q4	18.3	-0.1	2.9	53.0	1.33	2.3
South Korea	1.3	Q4	-1.6	1.5	4.2	Mar	2.8	3.1	Feb§	2.6	-2.1	3.3	25.0	1,316	-7.7
Taiwan	-0.4	Q4	-1.5	1.9	2.4	Feb	1.6	3.6	Feb	11.8	-2.2	1.3	31.0	30.4	-5.7
Thailand	1.4	Q4	-5.9	3.8	2.8	Mar	2.5	0.9	Feb§	2.1	-2.7	2.6	26.0	34.2	-2.0
Argentina	1.9	Q4	-6.0	-0.2	102	Feb	90.6	6.3	Q4§	-1.0	-3.9	na	na	211	-47.1
Brazil	1.9	Q4	-0.9	1.0	5.6	Feb	5.2	8.6	Feb§‡‡	-2.9	-7.9	12.7	147	5.08	-9.2
Chile	-2.3	Q4	0.2	-0.2	11.9	Feb	7.8	8.4	Feb§‡‡	-5.6	-2.5	5.3	-81.0	812	-4.0
Colombia	2.9	Q4	2.7	1.6	13.3	Feb	11.9	11.4	Feb§	-4.7	-4.4	11.5	220	4,579	-19.1
Mexico	3.6	Q4	1.8	1.4	7.6	Feb	5.9	2.8	Feb	-1.0	-3.7	8.9	52.0	18.1	9.0
Peru	1.7	Q4	-6.0	1.9	8.4	Mar	6.5	7.0	Feb§	-3.3	-1.6	7.4	87.0	3.77	-4.0
Egypt	3.9	Q4	na	3.0	32.0	Feb	19.2	7.2	Q4§	-2.9	-6.5	na	na	30.9	-41.0
Israel	2.8	Q4	5.6	2.9	5.2	Feb	3.8	3.9	Feb	3.9	-2.0	3.8	161	3.58	-10.3
Saudi Arabia	8.7	2022	na	2.8	3.0	Feb	2.2	4.8	Q4	6.5	1.6	na	na	3.75	nil
South Africa	0.9	Q4	-4.9	1.3	7.3	Feb	5.1	32.7	Q4§	-1.9	-4.5	9.9	32.0	17.9	-18.6

Source: Haver Analytics. *% change on previous quarter, annual rate. †The Economist Intelligence Unit estimate/forecast. §Not seasonally adjusted. ‡New series. **Year ending June. ††Latest 3 months. ‡‡3-month moving average. §§5-year yield. †††Dollar-denominated bonds.

Markets

In local currency	Index Apr 4th	% change on: one week	Dec 30th 2022
United States S&P 500	4,100.6	3.3	6.8
United States NAScomp	12,126.3	3.5	15.9
China Shanghai Comp	3,312.6	2.1	7.2
China Shenzhen Comp	2,139.4	1.7	8.3
Japan Nikkei 225	28,287.4	2.8	8.4
Japan Topix	2,022.8	2.9	6.9
Britain FTSE 100	7,634.5	2.0	2.5
Canada S&P TSX	20,275.8	3.1	4.6
Euro area EURO STOXX 50	4,315.3	3.5	13.8
France CAC 40	7,345.0	3.6	13.5
Germany DAX*	15,603.5	3.0	12.1
Italy FTSE/MIB	27,026.6	2.6	14.0
Netherlands AEX	758.4	3.3	10.1
Spain IBEX 35	9,183.2	2.7	11.6
Poland WIG	59,027.2	4.0	2.7
Russia RTS, $ terms	983.5	-1.6	1.3
Switzerland SMI	11,073.5	2.2	3.2
Turkey BIST	4,984.1	3.6	-9.5
Australia All Ord.	7,431.5	2.9	2.9
Hong Kong Hang Seng	20,274.6	2.5	2.5
India BSE	59,106.4	2.6	-2.9
Indonesia IDX	6,833.2	1.1	-0.3
Malaysia KLSE	1,429.6	1.5	-4.4

	index Apr 4th	% change on: one week	Dec 30th 2022
Pakistan KSE	39,687.3	-1.0	-1.8
Singapore STI	3,311.1	1.7	1.8
South Korea KOSPI	2,480.5	1.9	10.9
Taiwan TWI	15,868.1	1.1	12.2
Thailand SET	1,594.1	-0.8	-4.5
Argentina MERV	251,488.3	3.8	24.4
Brazil BVSP*	101,869.4	0.7	-7.2
Mexico IPC	54,176.0	1.8	11.8
Egypt EGX 30	16,998.4	6.9	16.4
Israel TA-125	1,735.2	-0.9	-3.7
Saudi Arabia Tadawul	10,948.6	4.6	3.8
South Africa JSE AS	77,458.6	1.9	6.0
World, dev'd MSCI	2,796.8	3.4	7.5
Emerging markets MSCI	987.6	1.7	3.3

US corporate bonds, spread over Treasuries

Basis points	latest	Dec 30th 2022
Investment grade	155	154
High-yield	505	502

Sources: Refinitiv Datastream; Standard & Poor's Global Fixed Income Research. *Total return index.

Commodities

The Economist commodity-price index

2015=100	Mar 28th	Apr 3rd*	% change on month	year
Dollar Index				
All Items	153.7	156.2	-0.9	-19.7
Food	137.3	141.0	-1.2	-13.3
Industrials				
All	169.1	170.5	-0.7	-24.0
Non-food agriculturals	122.3	123.4	-0.7	-31.3
Metals	183.0	184.5	-0.7	-22.4
Sterling Index				
All items	190.3	192.4	-5.1	-14.9
Euro Index				
All items	157.4	159.1	-3.7	-19.3
Gold				
$ per oz	1,969.6	1,986.3	9.2	2.9
Brent				
$ per barrel	78.8	84.9	1.8	-20.4

Sources: Bloomberg; CME Group; Cotlook; Refinitiv Datastream; Fastmarkets; FT; ICCO; ICO; ISO; Live Rice Index; LME; NZ Wool Services; Thompson Lloyd & Ewart; Urner Barry; WSJ. *Provisional.

For more countries and additional data, visit
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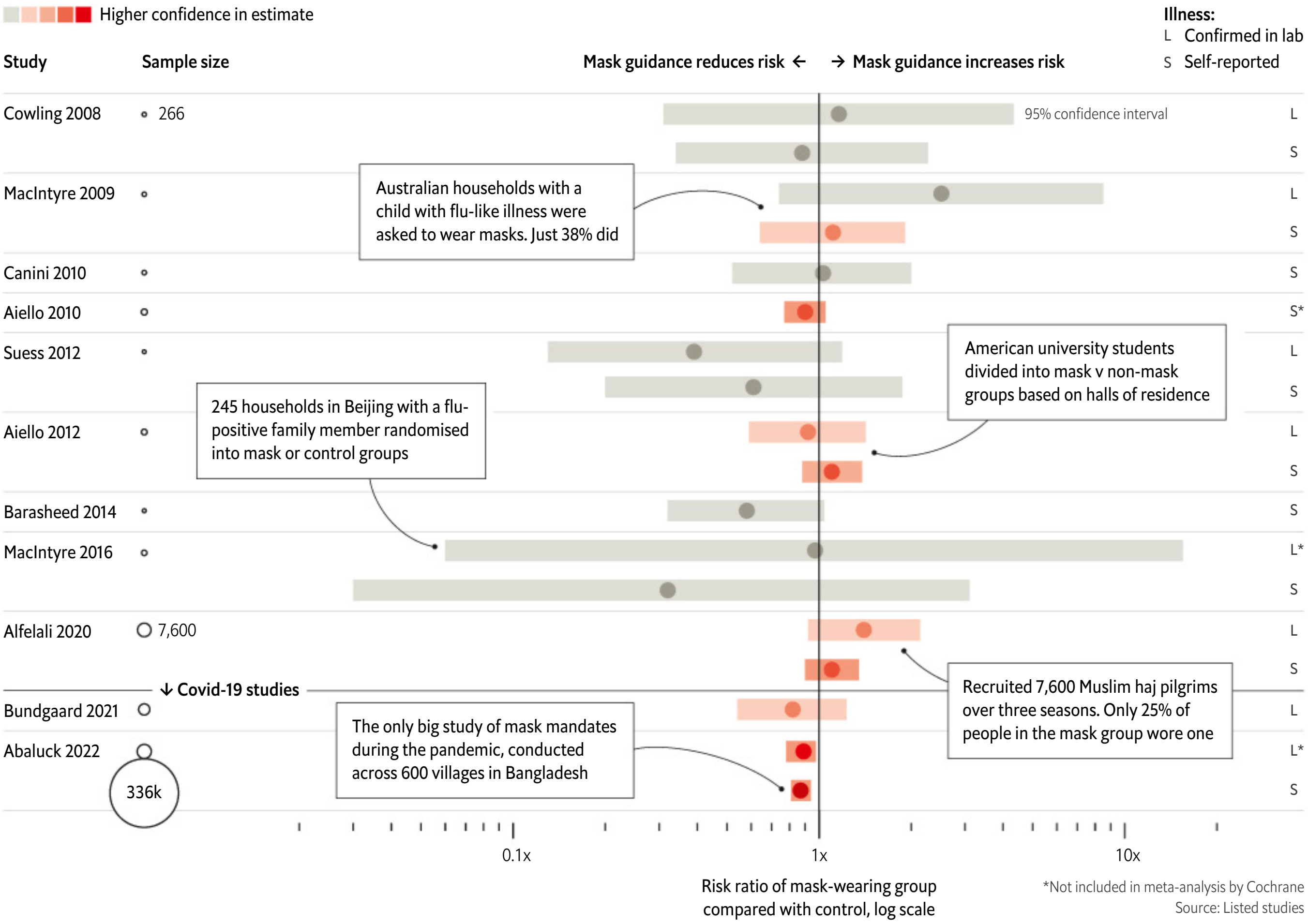
→ **Most studies on mask-wearing guidance are inconclusive, but the largest covid-era study showed benefits**



Australian households with a child with flu-like illness were asked to wear masks. Just 38% did

American university students divided into mask v non-mask groups based on halls of residence

245 households in Beijing with a flu-positive family member randomised into mask or control groups

Recruited 7,600 Muslim haj pilgrims over three seasons. Only 25% of people in the mask group wore one

The only big study of mask mandates during the pandemic, conducted across 600 villages in Bangladesh

*Not included in meta-analysis by Cochrane

Source: Listed studies

Garbage in, garbage out

A new study of studies reignites controversy over mask mandates

THE COVID-19 pandemic may be fading into history, but debate over disease-control policies remains fierce. In January Cochrane, a non-profit, published a meta-analysis (a study of studies) on mask mandates, which did not detect statistically significant evidence of their effectiveness.

Critics of lockdowns have touted this result. “Mask mandates were a bust,” wrote Bret Stephens of the *New York Times*. “Sceptics who were furiously mocked as cranks... were right. The mainstream experts and pundits...were wrong.” A *Wall Street Journal* op-ed last week said the media had refused to cover it to “squelch dissent”. Supporters retort that it showed no such thing. “The number of deaths would have been much higher” without “mask mandates [and] social distancing”, Michael Brown, a member of Cochrane’s editorial board, said later. “I’m very confident of that statement.”

Why are people who disagree so strongly citing the same paper? Although Cochrane is often called the “gold standard”, its meta-analyses are only as good as the studies they combine. And the lack of reliable research conducted during the pandemic prevented Cochrane from reaching a definitive conclusion itself. This left ample evidence for both sides to cherry-pick.

Cochrane considered only randomised controlled trials (RCTS), in which people were told randomly either to wear surgical masks or to act as normal. It found ten such studies. Of the eight that predated covid, five measured viral spread within the homes of people with flu, and did not find significant benefits in the mask group.

These papers are of limited relevance to the debate over covid-era mandates, which applied to public places, not homes. But four of the other five trials, which asked participants to wear masks outside their homes, also failed to produce significant evidence in favour of masks—including one on 5,000 Danes amid the pandemic.

Backers of mandates can still find flaws in these studies. On average, just 35% of people assigned to wear masks actually did so. Moreover, those who masked up still mingled with unmasked people, meaning they were not protected by the masks of others—a core aim of mandates.

Just one study, of 336,000 Bangladeshis, resembled a true mandate. Villages were randomly chosen to receive free masks, instructions on use and incentives to comply, causing mask-wearers to cluster together. The share of people wearing masks in these places was 29 percentage points higher than in control villages. Reports of covid symptoms were 11.6% rarer, and the prevalence of antibodies was 9.5% lower.

This paper is not the last word. Other scholars have cast doubt on its results, noting that fewer households were counted in control-group villages than in mask-group ones. And although studies using other methods find that mask mandates helped, causality is hard to prove without a RCT.

As the pandemic raged, health officials focused on implementing policies they thought might save lives, rather than on running studies—which require withholding those policies from a control group—to see if their efforts worked. Sadly, this means that whenever a new virus emerges, little will have been learned for certain. ■

Sculpting from stuff

Phyllida Barlow, a sculptor, died on March 12th, aged 78

Her art emerged, she once said, from a childhood memory of climbing up an empty staircase, hoping for the sky. There, in that gaping space, she would feel the reach and stretch of plaster, cement, colour, surprise; the excitement of perilous moments; the sentient fear of vertigo; the big anthropomorphic shapes that stared and waited: dumb, curvaceous, still, biding their time. That was where the adventure began.

For the viewer the adventure began in the discovery of her work in all its size and strangeness. It was not so much a case of looking at her art as running up against it. Visitors to the British pavilion at the Venice Biennale in 2017 felt like Lilliputians staring up at the vertiginous painted struts that soared up to the roof or inching around the giant pompoms on stilts that were squeezed against the walls. Her work was so tightly crammed into the space that one friend said it reminded her of Alice consuming the “eat me” cake.

A descendant, on her father’s side, from Charles Darwin, she retained a great rationality about what the world might throw up. She was not, in any way, an intellectual artist, claiming always to be bad at ideas. Instead she saw her art as a metaphor for her experiences. Her own adventure started in Newcastle-upon-Tyne, in Britain’s industrial north-east, where she was born in 1944, when the country had already been at war for five years. Her father was a psychiatrist researching brain trauma (his hospital orderly was Ludwig Wittgenstein). Newcastle, and London, where the family later moved, were cities recovering from trauma of their own. She remembered streets covered in rubble, buildings stripped of their outer walls with long ribbons of wallpaper swinging in the breeze, the cubbyhole under the stairs where her grandmother stuffed anything in case it could, one day, be put to use.

The ever-shifting industrial environment of Finsbury Park, in north London, where she and her husband, Fabian Peake, also an artist, moved after she finished art school in 1966, recalled the incongruous largesse that war spreads upon the landscape. From skips in the street she would collect odd bits of timber, cardboard, wire mesh and offcuts of polystyrene, scrim and chicken wire—anything that might one day be useful. One of her favourite words was “expedient”. During lockdown she even worked in dough she made in her kitchen.

She became an artist at a time when that meant having a studio and making work, not becoming part of the “art world”. She raised five children and had a day job for nearly 40 years, teaching at the Slade School of Fine Art. Making art was something she did in short bursts between taking care of the family and going to Tesco. Redecorating, housework even, it all went overboard (they never moved from the house they bought in the early 1970s), as did shopping for clothes. For years she lived in trousers, lace-ups and a paint-spattered anorak.

Exhibitions meant showing her work in an abandoned attic, a school playground, a disused office, an old stocking factory—even chucking it one time into the Thames. It was not art for sale, at least not early on. So she’d make work and then take photographs of it. Often that’s all that survived, for she’d pillage from one work to make the next. Once, at the end of an exhibition (when she had become better known), a gallery-owner apologised for selling only three of the four big pieces on show. What to do with the last, she was asked? Oh, just put it on the bonfire, was her reply.

English to the core in her humour and practicality, she could not have been less English in her artistic heritage. In contrast to the early Victorians who toiled from morning till sundown remaking classicism in their own design, she was a night thief, picking the pockets of the Arte Povera movement of post-war Italy and the unschooled makers of America’s deep South. She said she was suspicious about the dishonesty of certain sculpture; bronze, for example, which was hollow if you sawed through it. She explained it once to a curator by pointing to a fuzzy red jumper that was draped over a chair. What she wanted to convey was the red fuzziness, not the fact that it was a jumper. The vital thing for her was less the artwork itself and more the working—the making—of the art.

As a child she was always making things with clay or other soft stuff. That never stopped. As an adult she would begin with whatever materials she had at hand; felt, perhaps, or polythene or sellotape. She’d dip the work in paint, wrap it in binbags or bind it with fabric or sticky tape. And then she would stand back and look to see how it lived on its own.

Sculpture had to do more than just be conventional arrangement. It had to enlighten, show the way. Spillages taught you how to be casual; hanging instructed you about the stillness of uninterrupted looking; spreading about where edges can be found.

There was nothing slick or smooth about her sculpture, one critic said; it was full of knockabout. Things tottered, or dangled, or seemed to be about to topple over. From very early on, she made use of every spare moment, making sure she finished at least something by the time she had to turn her attention back to her family or her students. The work would emerge with speed. But never was it slapstick.

Late to the party

The art world only really caught up with her after she retired from teaching, aged 65, and threw herself full-time into making art. A super-gallerist, Iwan Wirth, came calling in his chauffeur-driven Audi, uncertain when he got to Finsbury Park that he had come to the right place. But he had. Exhibitions, one bigger than the next, soon followed: at the High Line in New York, Haus der Kunst in Munich and the Venice Biennale.

Why do humans make sculpture? George Mallory is supposed to have said he wanted to climb Mount Everest simply because it was there. Sculpture’s special power, by contrast—the reason why Phyllida Barlow made sculpture at all—is that it isn’t there. That was where her adventure began. ■

Subscriber-only live digital event

China and Russia: the new balance of power

Friday April 14th

4pm BST / 11am EDT / 8am PDT

More than a year after Vladmir Putin's invasion of Ukraine, how has the war reshaped global political alliances? Join our editors for a discussion of the deepening partnership between China and Russia and for prescient perspectives on the changing geopolitical order.

There will be the opportunity to ask questions throughout the session.

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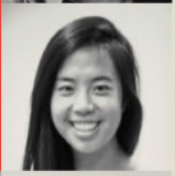

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